The Iraqi Ministry of Health
وزارة الصحة العراقية

SMART – Disease Surveillance Application **Final Report and Assessment**

Delivered for Technical Assignment #3
Prototype Disease Surveillance Application Pilot Deployment
under Subcontract No. 11980
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Abt VOXIVA Smart COMMUNICABLE DISEASE SURVEILLANCE

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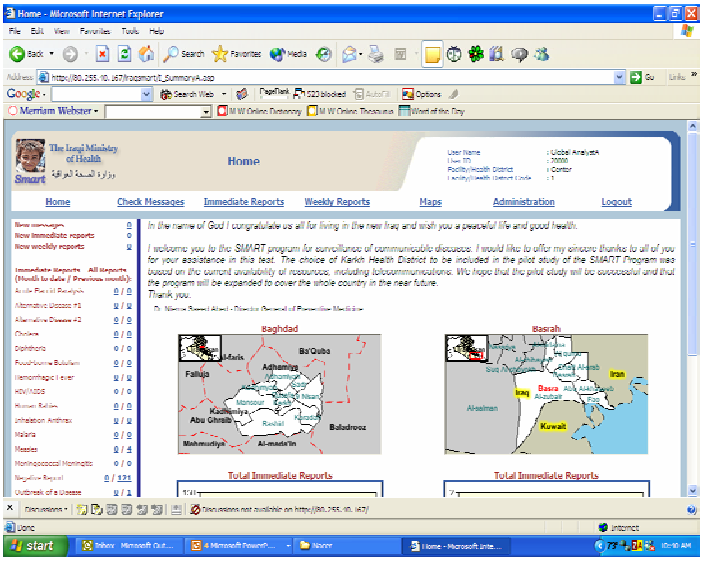
SMART Disease Surveillance System Pilot Deployment
24 March – 2 May 2004

Background

Under Technical Assignment # 3 of its subcontract with Abt Associates for the Iraq Health System Strengthening Project, Voxiva deployed the SMART Disease Surveillance System in the Karkh Health District of Baghdad. SMART is a real-time electronic disease surveillance system, the first of its kind in the Middle East. The system allows health workers to report cases of disease from any phone or over the web and allows health authorities to monitor the data in real-time.



The SMART system was developed under Technical Assignment #1. Voxiva customized its base disease platform to meet the requirements of the Iraqi Ministry of Health, with guidance from USAID, CDC and WHO. SMART was deployed on a pilot basis in the Karkh District under TA#3. Original plans for a simultaneous pilot deployment in Basra were cancelled due to the reduction in the level of funds available for training, connectivity and supervision.

The SMART pilot ran from March 24th through April 28th. In that time, 407 reports were submitted from 29 reporting facilities. Feedback from users indicated a high level of satisfaction both in terms of ease of use and usefulness of system features. Ministry of Health officials have enthusiastically recommended expanding SMART nationwide.

The assessment of the SMART pilot, though more limited in scope than originally intended due to the worsening security situation and evacuation of staff, was completed on May 20, 2004. The results are below.

SMART System Description

The SMART disease surveillance application was designed to solve a fundamental problem in disease surveillance. In Iraq, as in many developing countries, disease surveillance has traditionally been a slow, paper-based process. Weeks or months can pass before health authorities learn of new outbreaks.

SMART allows information to flow directly from health clinics into a national-level system so that health authorities can monitor the situation and respond in real time. Frontline health workers submit disease reports in real time from any phone or Internet-connected device. Each user receives an account number and PIN, and a plastic card with simple instructions and codes for all the diseases they need to report. From a phone, they dial a dedicated number to access the system.

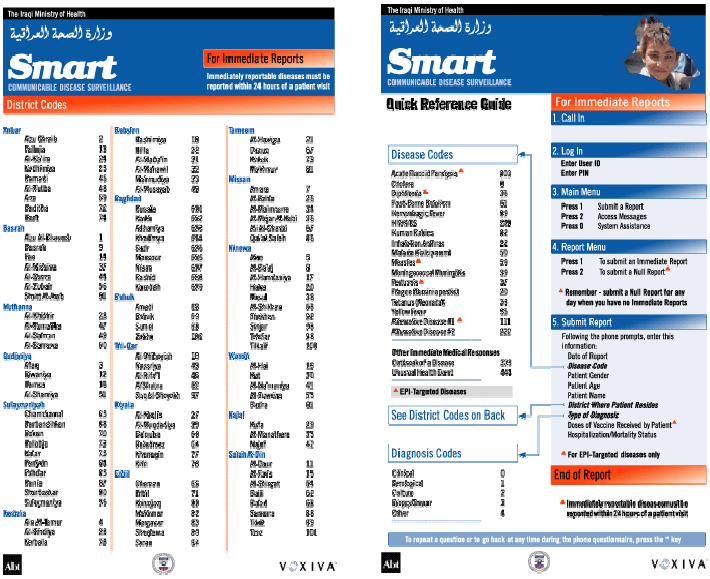
Authorized users log on and follow instructions on a prompt card or a simple voice-prompted menu and enter digital information about cases of disease or other public health incidents. They can attach additional information in voice files. Each user also has a voicemail account, which they can access when they log on. Thus, rural health professionals are able to send and receive voice messages, even if they do not own a telephone. Ultimately users are also able to receive health alerts, information about diseases, vaccination programs, training opportunities etc.

Health authorities can monitor incoming cases through a web interface. Individual disease reports arrive in real-time with full case details. Authorities can listen to voice files recorded by remote health workers. Data are available immediately, and health officials can export data to various programs for analysis and presentation. Geographic Information Systems can also be used to view data using dynamic maps.

Designated users receive automatic notification of selected reports - via email, voicemail or SMS message. Health officials can communicate with remote health professionals using voicemails as if they were emails - to individuals or to pre-determined groups of users.

The SMART system for Iraq includes:

- **Rapid disease reporting**: Designated system users input information about suspected or confirmed cases of immediately reportable diseases (according to a list established by the MoH) using either the telephone or the Internet. For the pilot, telephone reporting was the principal method for entering immediately reportable diseases. The data is automatically entered into a database, and made available over the web to authorized users. A second group of



SMART User Prompt Card

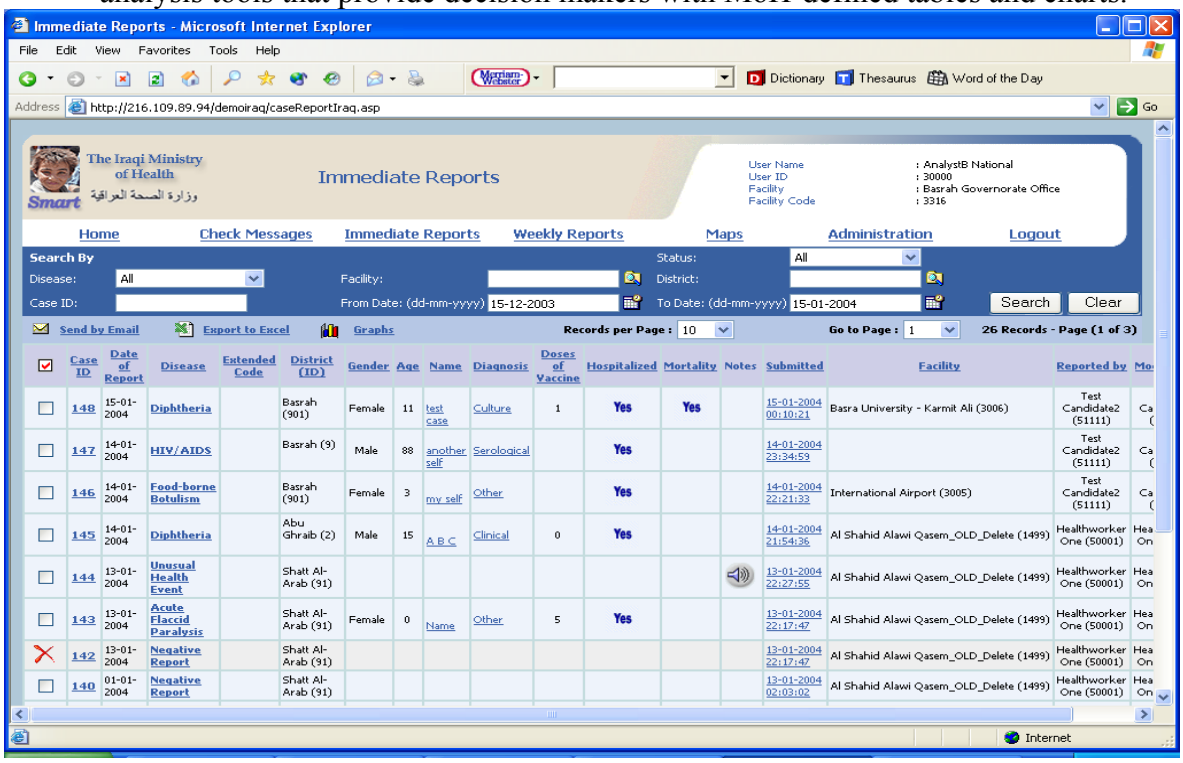
diseases, to be reported collectively from health facilities on a weekly basis, can be entered into the system by data entry clerks at the district. While this feature was available, the MoH decided not to use it during the pilot.

- **Multi-lingual:** The system included Arabic and English telephone menus

- **Data security:** Authorized individuals are registered in an electronic directory and receive a secure login name and PIN. Depending on their specific authorizations and permissions, individuals are allowed to submit reports, send or receive alerts and/or view and download specific classes of data. For example, to preserve patient privacy, only a selected group of users with a "need to know" would be provided with system permissions to view patient names.

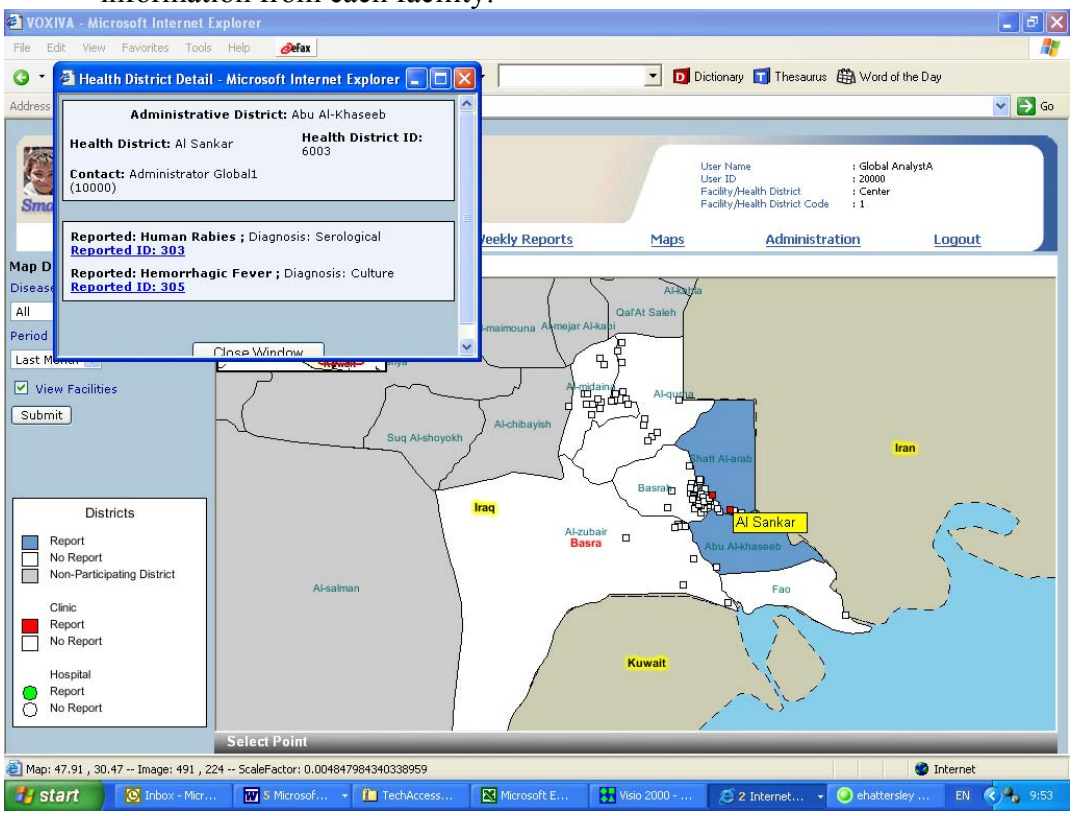
- **Flexibility of text/voice addendums to data reports**: Users reporting data are able to input unstructured information relevant to the case, either using a free-text box on the web or with a voice message if reporting by phone. This message is appended to the case report, allowing for a more complete description of a case, contexualization or a request for information or support. The same function is used to immediately report and elaborate on any unusual disease patterns or outbreaks of unknown origin.

- **Data views:** According to their permissions and authorizations, users of the network can view, sort and export data for analysis. The system supports basic analysis tools that provide decision makers with MoH-defined tables and charts.



SMART's case view page.

- **Mapping**: The disease surveillance application includes reporting capabilities in the form of maps using a Geographic Information System. Maps also display location of health facilities and provide access to both reports and facility information from each facility.



SMART's map-based view of data. Reports are mapped according to the reporting facility.

- **Automatic alerts**: The system is configurable to automatically send email or SMS alerts to designated individuals whenever data of a specific nature is entered into the system. If a measles outbreak occurs, for example, it is possible to send alerts to vaccination teams or vaccine warehouses.

- **Broadcast and individual messages:** The voice mail function makes it possible to send messages to individual members of the electronic network, all members, or a subset of the members – for example, those in a particular region or all those reporting a certain type of disease. These messages can take the form of emails, SMS messages or voicemails.

- **Training:** Voxiva developed user guides and training materials to support implementation of the application.

Prototype Development

Under TA #1, Voxiva undertook the requirements gathering and corresponding software customization for the Iraq disease surveillance software application and began the process of deployment planning. This process was conducted in close collaboration with the MoH (CPA and Iraqi) and included extensive interviews and data collection in the two originally designated pilot implementation zones, the Al Karkh health district of Baghdad and the Basra governorate. These were selected by Abt in consultation with USAID/Baghdad. During this process, WHO officials in Baghdad, Cairo and Geneva were also consulted.

The software was customized to the specifications. The specifications document, the principal deliverable under TA # 1, summarized the results of the requirements gathering process and delineated specific functionality for the prototype system. A coordination meeting was held with the US Centers for Disease Control's information technology team to ensure that the system to be deployed would be compatible with more investigative surveillance systems under consideration by the CPA (Health) with CDC support.

Pilot Deployment

Under TA #3, deployment began with the finalization of training materials, the shipping of the required hardware to Baghdad and its installation in a local hosting facility operated by a third-party communication provider in Baghdad, TigrisNet. The servers and software were installed, connected to the internet and fully tested and functional at the TigrisNet facility in Baghdad by mid-February.

Connectivity Challenges: From a technology viewpoint, issues beyond Voxiva's control, especially local telephone infrastructure, presented considerable challenges. Expected repairs to switches in the Al Mansour district where TigrisNet is located were not carried out in time for the pilot. The lack of a working exchange in Al Mansour meant that the servers could not be easily connected to the telephone system to receive telephoned reports from health workers. This possibility had been anticipated during the requirements gathering mission of TA#1. A fallback plan by which the TigrisNet servers would be connected to a working exchange via a wireless link was therefore initiated. Unfortunately, early assurances on the part of CPA Telecoms and the Iraqi Telecommunications and Post Company that the alternative connection scheme would be facilitated were unexpectedly and suddenly reversed, requiring a complex and frequently changing application process in order to re-gain approval. Though the request was at first turned down, intervention on the part of CPA Health was ultimately led to a temporary licensing approval for the use of the proposed 5.745GHz frequency.

Obtaining license approval unfortunately did not solve the problem. First ITPC delayed action on Voxiva's request for required lines into the alternate facility. Then it announced a doubling of the price for the per line connection charge. Once the payments were made and work orders issued, the manager of the exchange selected for the installation of wireless gateway questioned the validity of the work order. More meetings were required to win his agreement but he refused to permit installation of the equipment in ITPC racks, requiring purchase of additional racks and a separate UPS unit. Then, just as all of those issues appeared to be resolved, a missile struck the central Baghdad exchange where the computer used to assign numbers to specific exchanges is located. Throughout the pilot, the presence of unexploded ordinance at that facility precluded the work necessary to finalize the wireless connection that would have linked health workers in Al Karkh district with the fully functioning servers in Al Mansour.

Meanwhile, in Al Karkh, the priority repairs of individual landlines to the health facilities by ITPC were instantly vitiated by the bombing of the telephone exchange serving most of Al Karkh. The combined good faith and creativity of the leadership of the MoH's Communicable Disease Control Center (CDCC), that of the Al Karkh Health district, Voxiva staff, Voxiva's partner MPRC and Abt CoP Jerry Evans resulted in a workable solution to allow the pilot to proceed. A set of local mobile phones (Iraqna) was procured and positioned at strategic locations within Karkh. Health facilities were assigned to a specific reporting site and, on regular intervals, health workers trained in the SMART system traveled to their assigned site to make their reports. At the sites, user support agents, supplied by Voxiva through contract with its partner MPRC, assisted users with their reports, helped solve problems and verified that there was no misuse of the phones.

Because the health workers in Al Karkh would not be able to directly reach the Baghdad servers until the wireless gateway could be installed, an alternative for reporting was proposed and discussed with the MoH and Abt. Making use of the fact that reports were to be filed using phones of the new mobile network, Iraqna, the idea was to use that network's relatively efficient and reasonably inexpensive international connections to make the reports to a copy of the SMART application installed on Voxiva's servers in the US. Abt generously agreed to fund telephone call time so that the pilot could proceed.

Training: Training was a major component of the pilot deployment. It began in January with a training-of-trainers session for 10 MoH officials conducted in Amman, Jordan. Evaluations from the ToT session were very positive with 7 of the 10 participants describing themselves as "extremely satisfied" and the other 3 as "very satisfied" with the course. During the five day program, participants not only mastered the SMART telephone reporting system but also learned and practiced training techniques for

passing those skills on to others. The trainers were also provided with an introduction to the web interface for SMART. A presentation of SMART by the participants to the Iraqi Minister of Health on the last day of the program demonstrated their confidence and enthusiasm.

Health worker training for the pilot deployment took place during two three-day sessions at the CDC in Baghdad. While a plethora of official holidays in February led to numerous delays in the start of training, training was successfully completed by March 8th. A total of 32 people received training, conducted by those previously trained in Amman. Ministry of Health officials were present and observed both training programs. Evaluations of the training were equally positive. Twenty-eight of the 36 participants said that they were extremely satisfied while the other eight pronounced themselves to be very satisfied.

Diseases Reported, Al Karkh
24 March – 28 April 2004

Negative Report	**300**
Acute Flaccid Paralysis	**3**
Cholera	**1**
Diphtheria	**3**
Measles	**20**
Pertussis	**36**
Outbreak of a Disease	**43**
Unusual Health Event	**1**
Total Reports	**407**

Pilot Operations: Plans for the pilot had been presented to a SMART Project Steering Committee, officially created by the Deputy Minister of Health, Mr. Nizar Hassan Ali, on February 17th (Annex 1). The committee's first meeting was held on March 2nd. The launch of the pilot was originally set for March 14th but was postponed until March 24th due to the start-up of a national immunization campaign during the third week of March. Once launched, health workers from the 29 reporting facilities exhibited both mastery of the required skills and enthusiasm by regularly reporting despite the inconvenience of having to travel to a neighboring site to make their reports. After two weeks, the suggested minimal frequency of reports was reduced from daily to twice weekly, except for diseases requiring immediate notification. A total of 407 reports were recorded during the 5 weeks between March 24th and April 28th. Of these, 300 were null reports (indicating that the facility in question had diagnosed no cases of diseases on the designated list of immediately reportable diseases); 43 related to an unexpectedly high number of mumps cases (outbreak); one reported an unusual health event and the remaining 63 related to specific diseases.

Assessment Process

The focus of the assessment of SMART's pilot deployment was on the functioning of the application and its use by health workers and managers more so than on the "contextual" issues that neither Voxiva, nor the MoH nor Abt, had direct control over (in particular, security, telecommunications infrastructure, and lab capacity). In striving to build a system that will meet the needs of the "new" Iraq in the near-to-medium-term future, the assumption is that each of these will gradually be resolved. The first, security, is perhaps the most problematic and could impact the resolution of the other two. But in the views

of the Iraqi leaders responsible for disease surveillance and several of the international experts consulted, the use of telephone reporting and automatic alerts are excellent responses to the challenges of the security situation since they require less movement of people and are quicker and more flexible than the current, paper-based system.

In the short term, it can be argued that both telecommunication infrastructure and laboratories are obstacles. However plans and budgets are in place to address both issues. Voxiva's approach in designing SMART was inspired by the forward-looking principles of the original IHHS project document. The strategy and vision behind the design led to a focus on the longer term processes of laying the foundation for new information systems, building the human and institutional capacities, and fostering the growth of an information-based management culture. Once the relatively easier task of re-building infrastructure reaches its conclusion, these less tangible but more critical factors for the success of a state-of-the-art health information system will be in place, thanks to the work of the broader Abt team.

The comprehensive assessment process at the end of the pilot deployment was comprised of multiple elements:

- A software audit (test plan completion report) to verify that the customization met the specification as defined by the MoH
- A user survey of health workers who entered disease reports using the system's telephone interface
- A "virtual" group interview with management-level personnel who used the system's web interface and oversaw the pilot implementation
- A functional assessment of the SMART application by a select group of six external experts, most with specific knowledge of disease surveillance in Iraq
- An analysis of data coming from the SMART system logs

The results of each of these components are summarized below with more detailed data from each contained in the annexes.

Software Audit

Upon completion of the beta version of the SMART system application, Voxiva technicians implemented a series of systems tests based on the functional specifications agreed to with the Iraqi Ministry of Health. Bugs were identified and addressed prior to client delivery. A final series of exhaustive tests verified that all systems function passed. For more detailed information, please consult the Test Plan Completion Report (Annex 1).

Telephone Interface User Survey

A survey instrument was designed using standard templates customized for the SMART program. Voxiva, MPRC and Abt staff worked collaboratively to fine-tune the

instrument, translate it into Arabic and verify its appropriateness based on Abt's previous work on written surveys in Iraq. The survey was administered using the Arabic version. It was handed out during a regularly scheduled meeting of the Karkh Health District during the first week of May. Instructions were given and questions answered by the director of Al Karkh Health District and Abt personnel. All twenty-nine health workers who received the questionnaire returned it completed. Copies of the instrument in English and Arabic can be found in Annex 2.

Demographics of respondents

Of the 29 health workers completing the survey, 28 completed the demographic questions. 26 were doctors, 2 were pathologists; 6 female and 22 male. They ranged in age from 28 to 52 with a median age of 40. Of the respondents, 37% had mobile phones of their own and 29% had home computers. Though the sample size was small, the gender differences in ownership of technology were interesting. Both mobile phone and computer ownership were at least twice as prevalent among the women in the sample as compared with their male colleagues.

Use of SMART

All of the respondents in Al Karkh reported having used SMART, either for submitting disease reports, null reports or both. Report submission was estimated by the respondents to have taken 1.9 minutes on average for null reports and 3.6 minutes for disease reports. This perception corresponds to the actual average call time of 3.62 minutes derived from call logs (see below). Ninety percent of the group considered SMART easy to use with the rest finding it difficult (7%) or very difficult (3%).

Assessing SMART's features, instantaneous reporting and the use of voice prompts to help with reporting were noted by the health workers as being the most useful. Relatively few tried the voice mail function (9) but those that did considered it "very useful" or "useful." In terms of SMART's potential impact, most (25) considered the system's rapid transmission of data to be the greatest benefit though large numbers also cited the ease of reporting (21).

Asked about their concerns regarding the expansion of SMART to a national system for disease notification, half of the respondents considered connectivity to be of high or moderate concern (see comments below). Less than 1/3 of the group felt that the skill level of the health workers, data quality, or data security were of high or moderate concern.

Training and Support

Of the 28 respondents answering the questionnaire, 18 considered the training they received to have been very helpful and the other 10 judged it to be helpful. Training materials, user guides and other supports were seen as "very helpful" by 15, "helpful" by 11 and "not very helpful" by 3. The user support agents, provided as a Voxiva

contribution to the project through MPRC, were considered "very necessary" or "necessary" and "very useful" or "useful" by 75% of the health workers.

Comments and Suggested Enhancements

Health workers filling in the questionnaire provided numerous comments, the majority of which focused on the environmental conditions under which the pilot was implemented:

- The largest number of comments revolved around the challenges posed by telephone infrastructure. Most of these concerned the necessity during the pilot for health workers to travel to one of six central sites to make their reports using mobile phones supplied by Abt following the attack that damaged the telephone exchange serving most of the Al Karkh health district. The health workers' suggested solution was for each health facility to be supplied with its own mobile phone.
- A second set of recommendations related to the fact that telephone disease reports during the pilot had to be made to Voxiva's US-based server. Periodic difficulties in making the connection and the quality of those early connections led several to urge a rapid transfer to the Baghdad server as soon as possible. In fact, the success rate for reporting (approximately 75% of calls resulted in a registered report) is quite impressive given the nascent mobile network's often tenuous international connections. Several users mentioned the volume/clarity of the voice prompts due to the poor connections and suggested particularly that the case numbers at the end of reports be repeated to ensure that they are understood. One suggested providing health workers with earphones for the mobile phones to facilitate reporting and improve comprehension of voice prompts, case numbers, etc.
- A number of participants in the pilot commented on the list of diseases being reported via SMART. Several felt that the list contained too many uncommon diseases and not enough of those more regularly encountered (mumps, chicken pox, brucellosis, etc.). One participant questioned the need for "null" reports. Another suggested reducing the number of questions to be answered. These comments correspond with the fact that the CDC's list of immediately reportable diseases has been in flux. Once settled, there is a possible need for more discussion/training of health workers regarding the purpose behind the "immediately reportable" designation and the use of the data in those reports. In training, it should also be pointed out that many of the common diseases cited are included in the system's weekly reportable disease list.

- Six participants recommended that all health facilities be provided with computers and training in order to take full advantage of the SMART system.
- Two health workers encouraged the widening of the pilot to include more districts and eventually the entire nation

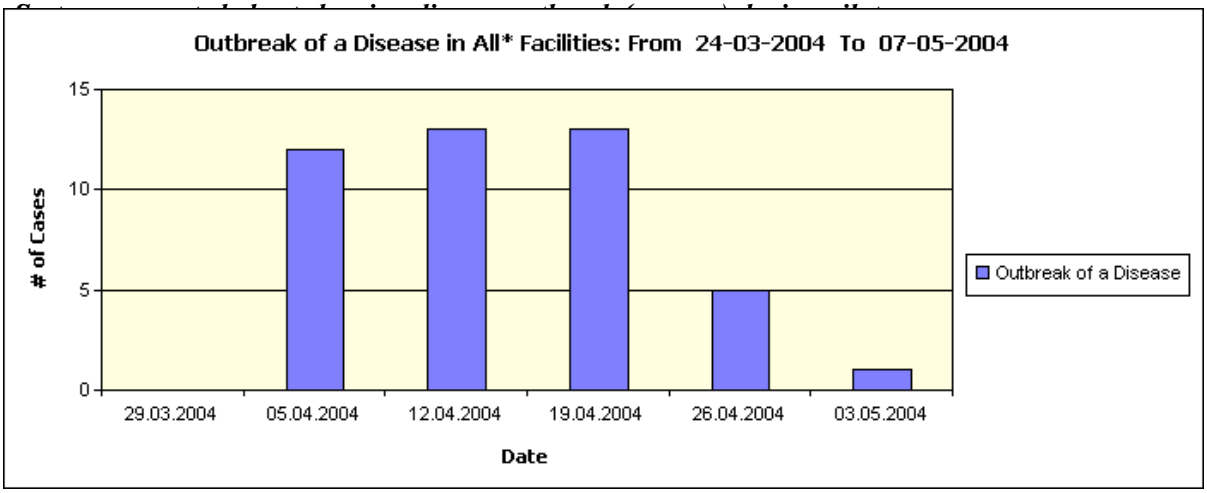
Among other individual comments:

- Include access to information regarding treatment and containment of communicable diseases via the SMART system
- Additional periodic training programs for health workers

Web Interface Virtual Group Interview

With technical support of Abt's technician in Baghdad, a virtual group interview was conducted with the three principal higher-level management users of the SMART system, Dr. Hanaa Bahjet, District Manager, Al Karkh Health District, Dr. Munir Kubba, Director of Communicable Disease Surveillance, MoH/CDC and Dr. Adnan Anwar, MoH/CDC. On the Voxiva side, the discussion facilitators were Dr. Pamela Johnson, Executive Vice-President and George Scharffenberger, Vice-President International. The discussion took place for approximately one hour and revolved around the following:

- how the SMART system was used during the pilot,
- the participant's views on the usefulness and potential limitations of the system,
- suggestions on ways in which the system's functions and customization could be improved,
- recommendations relative to the possible expansion of SMART to become a national system for surveillance of communicable diseases.

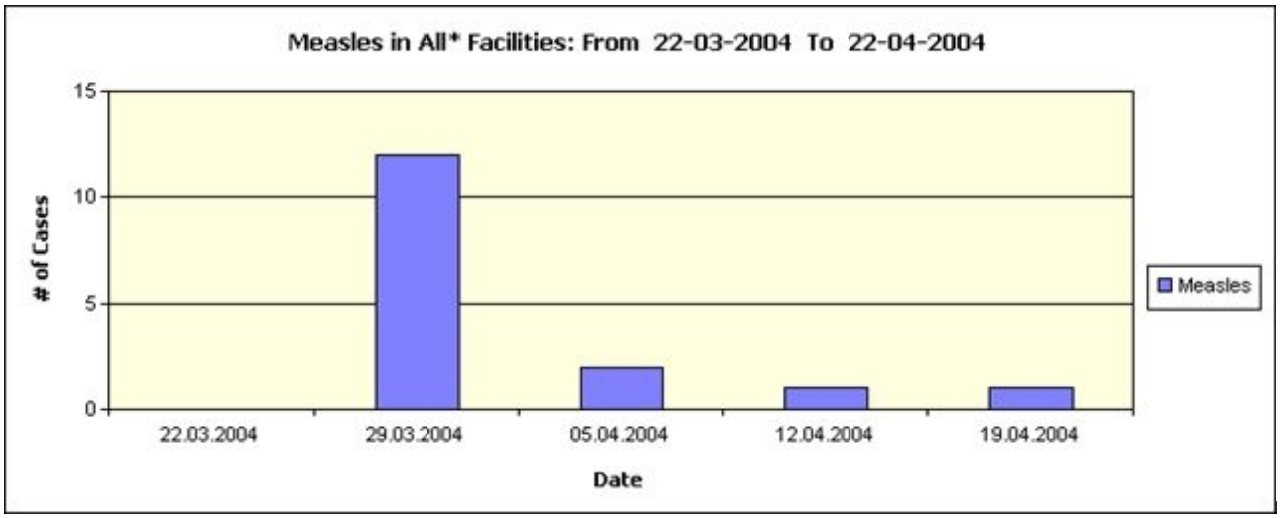


System Use

Dr. Munir and Dr. Adnan of the Communicable Disease Control Center both reported having used the system's web interface. System logs show that the two logged increasing time on the system as the pilot proceeded. Dr. Munir spoke of regular reviews of the data despite periodic power difficulties at their office. Numerous reports of disease outbreaks beginning early in the pilot and growing to a peak during the weeks of April 5th and 12th were followed up with phone calls to the Al Karkh District Manager who in turn contacted the reporting facilities to confirm the existence of an unusually high number of mumps cases. Dr. Munir pointed out that in this instance no action was taken since there isn't an official public health protocol in Iraq for responding to mumps. Nonetheless, Dr. Munir felt that the mumps outbreak demonstrated the potential value of the SMART system. "…we got the information the next day, not days later…Though we don't have a way to respond to mumps, things like diphtheria, hemorrhagic fever, etc. would require a quick response."

Dr. Adnan mentioned using the SMART graphing function to create a chart of measles case reports (clinical diagnosis) for the first month of the pilot (see below).

Dr. Hanaa, the manager of the Al Karkh Health District, was unable to use SMART's web interface to view data directly due to problems with the software on her computer but consulted the database using Dr. Munir's computer at the CDC. Software was also an issue on the computers at the CDC, where it appears that a non-standard version of Windows did not include the Java support required to listen to the recorded audio portion of the reports, until a new version of Java was loaded by Abt's computer support team. The need for future MoH procurement processes that include the requirement for authorized software versions is readily apparent.



Measles Chart Produced by Dr. Adnan Anwar, CDCC MoH

Usefulness and limitations of SMART

Dr. Munir commented on the system's rapid notification of diseases while Dr. Adnan spoke positively of the system's analytical functions. He pointed out that because the servers in Baghdad were not directly used, the pilot was more a test of the capacity of the health workers to assimilate the system's required skills. He felt that they had performed very well. Dr. Adnan encouraged connecting the Baghdad servers as soon as possible [Voxiva's George Scharffenberger explained the status of efforts to connect the Baghdad servers to the telephone infrastructure and the latest obstacle, that of a bomb landing in the building housing the central computer needed to make the connection]. Dr. Hanaa echoed Dr. Adnan's sentiment regarding the performance of the health workers, saying that the only problems experienced were caused by deficiencies in the telecommunications infrastructure. At the start of the pilot, a number of telephone connections to the server were prematurely ended by the Iraqna system before finalizing the report, though this improved over the course of the pilot. Dr. Munir agreed that the system performed well, saying that "if we have good communication, or even fairly good, [SMART] will be much better than paper. With paper, someone needs to carry the reports and that takes time. And there is the security problem…With this we can overcome the problem of security."

Referring to the health workers in Karkh, Dr. Hanna said, "They are now experienced with the system. At first there were technical problems [telephone] but it is better now… Now they have an easy way to report. Having nothing to report is the only reason not to report!" Later in the conversation she commented that the health workers "are very happy with using the system. Each one wanted to personally do their own reports rather than have them submitted by health workers at the central sites. That way they got very experienced."

Dr. Munir added, "It's very interesting. Most are doing reports – only one didn't. In our current notification system we don't get this high level of reporting. Twenty-eight out of

twenty-nine! That is very good….With all the communication problems in Karkh, this is impressive. When they have regular phone service it will be even better."

Dr. Adnan felt that SMART was, "easier, faster and provided more and more accurate information" compared with the paper-based system.

Suggested Improvements

In the course of the interview, the participants mentioned a number of suggested improvements:

- Adding weekly aggregate reports for non-immediately notifiable diseases by telephone (such reports can already be made via the SMART web interface)
- Home page maps should show the entire nation (in preparation for a national rollout)
- Dr. Munir mentioned that he had sent in an updated list of immediately reportable diseases and of all the health districts in the country for use in an expanded system. He also suggested modifications to the Arabic translation of some of the phrases on the user card to better conform with local usage [Annex 8].
- The issue of map interface representing administrative districts (as opposed to health districts) was raised. Voxiva pointed out that the lack of GIS maps for health districts in Iraq made mapping by health districts problematic. The alternative that some countries in similar situations were implementing was discussed, ie. that of changing health districts to match administrative districts.
- Using codes for governorates to facilitate aggregate reporting and disaggregation at that level

Expansion of SMART

All three felt that SMART should be expanded. Dr. Munir, in making his recommendation recognized that the expansion would have to be gradual, step by step, completing a group of one or two governorates at a time before moving on to the next. He mentioned to first bring in the rest of Baghdad, then Basrah, Mosil, Erbil and perhaps Hilla. He acknowledged that the main obstacle will be telephone connectivity but added that things are getting better. It was now possible to call several of the governorates from Baghdad. The second challenge will be training – not only in using the system (using phones for reporting, understanding the codes, etc.) but using computers, the internet and email. The third challenge he mentioned is that of maintenance. The equipment will have to be maintained and methods for such things as data backups will be required. The MoH will need expertise in using computers, but at the moment few have that expertise. The MoH will need experts to make repairs and to solve problems that the users can't resolve. Finally, expansion of SMART will confront the major problem of security.

The other two interviewees expressed their agreement with the recommendation and issues raised by Dr. Munir. All three expressed their appreciation for the work done

by Voxiva's technician, Saad Aboul Nasr, citing his hard work and enthusiasm. Dr. Hanaa, announced her imminent transfer to the Al Ahadmiya district and offered to take SMART with her.

External Expert Functional Assessment of the SMART Application

Voxiva invited a panel of six international public health experts with significant knowledge of disease surveillance systems to review a demonstration version of SMART to assess its functionality and features. Half of the group had Iraq-specific experience, either with WHO or the Coalition Provisional Authority. One of the others has worked on related issues elsewhere in the Middle East for the past decade. For the assessment, the demonstration site was established on the SMART server in Baghdad and populated with mock data that patterned a typical week of report data from the pilot. From there it was accessed by the 6 experts, 3 of whom were in the Middle East, one in Europe and two in the Americas. The suggested review guideline was completed by five of the six reviewers, the sixth preferring to supply comments using a different format.

The three features that received across the board recognition as most critical were: automatic notifications, automatic graphing, and data export. Voice mail received the lowest marks; though three users still ranked it as "extremely important," one of whom particularly selected this feature as one which could benefit the health system .

With respect to the potential benefits of SMART, the experts ranked the rapid transmission of disease reports as being "extremely important" across the board. Connectivity was seen as the greatest limitation to the utility of the system, with inadequate laboratory support as another key concern. Concerns about the laboratory support reflected broader concerns about data quality, not necessarily related to the Voxiva system: "The quality of the data is going to depend more on the diagnostic capabilities of the facility staff and laboratories than the means of reporting. The system should help central level staff notice if an outbreak with cases in several different facilities may be in process and to consequently initiate a response." In addition, several reviewers had comments regarding the layout/formatting of bar charts and graphs, and the ability to disaggregate by additional variables such as gender and age.

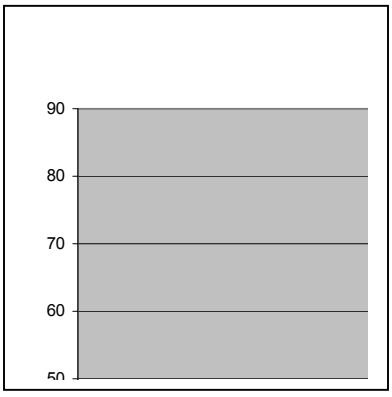
Across the board, experts recommended an increased ability to modify disease lists as the most important function to add in a future release, though some also cited adding GIS layers and improving data export functionality as important. One reviewer suggested that a security-related overlay to the GIS data would be a valuable boost to Iraqi epidemic

response efforts, as this is certainly a dimension of epidemiological response in Iraq at this time.

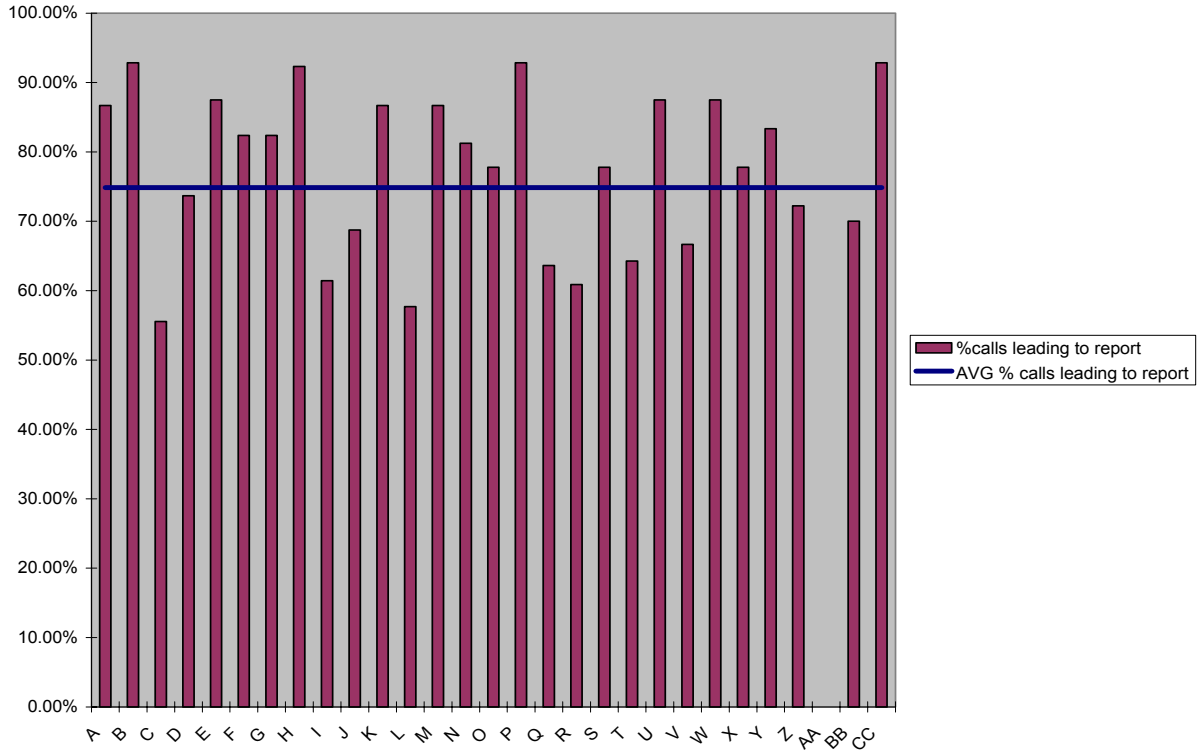
Though the experts pointed out important ways in which features and functionality can be enhanced and the workflow surrounding the system examined, the overall response to SMART was enthusiastic. One reviewer expressed support for the national rollout of SMART in Iraq, saying, "CPA is interested in helping the MOH develop a national computer based national reporting system. SMART could/should be incorporated into the planning." Pointing to the obvious need for more than just a good software application, one commented that, "If there are motivated people using the system and inputting reliable data, the system looks as if it would be of great benefit to the local MOH." And another expert noted that "SMART allows competent authorities to access data in a rapid, organized and analytical manner. My opinion is that current features provide the required tools to identify outbreaks and analyze evolution of health priorities."

Analysis of Data from System Logs

Voxiva basic system logs provide data on the number and length of log-ins and the actions performed. The logs for the pilot period (March 25 –May 2) indicate a total of 549 calls into the system. The average number of calls per health worker was 18.93 (maximum 83 – the next highest number of call by a single health worker was 26; minimum 2 – the next lowest number of calls by a single health worker was 13). 408 of these calls resulted in a disease report for an average report to call ratio of 74.86%. The average call length was 3.62 minutes. From the data, one health worker can be easily identified as having had difficulties. Under operational conditions, log data can be used to respond to such cases by assessing the causes for the lack of reports, be it for equipment, logistics, workflow or skill-level reasons.



Total Calls Per User During Pilot Deployment



Success Rate for Calls (Ratio of Recorded Reports to Calls)

Conclusion and Recommendation

Despite the challenging context, the pilot deployment of Iraq's SMART disease surveillance system was successful:

- Health workers mastered telephone-based reporting and judged it a useful method for fulfilling their critical reporting role in protecting the public health of Iraqis through timely and accurate disease surveillance.
- Reporting compliance was considerably higher than for the existing paper-based system
- During the pilot, national managers were able to read and analyze reports to identify an outbreak of mumps in "real-time," providing a glimpse of how the system, if it were to expand, could be used for identification and response to urgent public health situations.
- Though all involved in the pilot recognized the challenges caused by the destruction of the telecommunications infrastructure, they were able to see beyond the current situation to a near future in which that infrastructure will again be available to provide the platform for a vibrant, real-time, disease surveillance system.

The technical assessment by the panel of international experts supports the recommendation by the leadership of Communicable Disease Control Centre (CDCC) of the MoH that SMART be continued in the Al Karkh Health District and gradually

expanded throughout the country in pace with improvements in telecommunications infrastructure.

The CDCC has provided Voxiva (Annex 9) with updated lists of health districts, immediately reportable diseases (individual case reports) and other communicable diseases (aggregate reports to be reported weekly). They have also requested several minor modifications to the SMART disease reporting card and web/phone questionnaire. The estimated costs of these modifications can be supplied by Voxiva once a decision is made to continue/expand the SMART system.

Appreciation

Voxiva expresses its gratitude to all those whose support, guidance and encouragement have made possible our efforts to serve the Iraqi Ministry of Health and the Iraqi people through our participation in the IHHS project: the Coalition Provisional Authority, USAID, Abt Associates, the World Health Organization, and the US Centers for Disease Control and Prevention, among others too numerous to mention. We are particularly appreciative of the guidance, patience and persistence of our partners within the Ministry of Health of Iraq, and in particular, the three co-parents of the SMART system, Drs. Munir, Adnan and Hanaa. Their professionalism, devotion to their country and belief in its future have been a constant source of inspiration and hope.

Annex 1: **Declaration Establishing the Ministry of Health SMART Steering Committee**

Annex 2: **SMART Test Plan Completion Report**

Annex 3: **Telephone Interface User Survey Instrument (English and Arabic)**

Annex 4: **Results of Telephone Reporter Survey**

Annex 5: **Web Interface Virtual Group Interview Notes**

Annex 6: **External Expert Functional Assessment Questionnaire**

Annex 7: **Summary of External Expert Assessments**

Annex 8: **Analysis of Data from System Logs**

Annex 9: **Suggested customizations changes**

Annex 1: Declaration establishing the Ministry of Health SMART Steering Committee

بسم الله الرحمن الرحيم

جمهورية العـــراق

وزارة الصحة

الدائرة الادارية والقانونية

قسم الافراد

العدد/

التاريخ / /١٤٢٤هـ

/ /٢٠٠٤م

امـــــر وزاري

تقرر :-

تشكيل لجنة ادارة مشروع الرصد الوبائي SMART من المبينة اسماؤهم فيما يأتي :-

١- الدكتور نعمة سعيد عبد/ مدير عام دائرة الوقاية الصحية رئيسا"
٢- الدكتور عبد الجليل ناجي حسن/ مدير مركز السيطرة على الامراض الانتقالية عضوا"
٣- الدكتور منير صالح عبد الامير كبة / مدير شعبة الرصد الوبائي عضوا"
٤- الدكتور حسنين مصطفى/ مدير شعبة الامراض الانتقالية/ دائرة صحة بغداد/ الكرخ عضوا"
٥- الدكتور غسان عبود/ مدير شعبة الإمراض الانتقالية/دائرة صحة البصرة عضوا"
٦- الدكتور عدنان نوار خستاوي/ شعبة الرصد الوبائي

نزار حسن علي
ع/ وزير الصحة
/٢/٢٠٠٤م

نسخة منه الى/
مكتب الوزير/ للتفضل بالاطلاع ٠٠ مع التقدير
الدائرة الادارية والقانونية/ مكتب المدير العام
دائرة الوقاية الصحية / مكتب المدير العام
دائرة صحة بغداد/ الكرخ
دائرة صحة البصرة
مركز السيطرة على الامراض الانتقالية / اشارة الى كتابكم المرقم ٤٢٤ في ٢٠٠٤/٢/٩م
قسم الافراد/ شعبة الترقية وتغيير العناوين / شروق

بشرى محمد ٢/١٦

Annex 2: SMART Test Plan Completion Report

Test Plan Completion Report

Project Smart: Iraq MOH Disease Surveillance Pilot System

Smart

Introduction

Purpose of this Document

This document provides a final summary of the completion of system testing for the Project SMART system and serves as a checkpoint to indicate the functionality of the application is ready to "go live." This does not include any indication of readiness for hardware.

The Test Plan documents the test phases and activities that were planned for Project SMART testing. This Test Plan Completion Report documents completion of the all the specific test cases that were developed to test all system functionality. Test Cases were created, executed, and completed for web and IVR interfaces and for all appropriate system roles (e.g., Health workers, Data Entry Clerk, Analysts, etc.).

Test Case Identifier	Test Case Name	Web	IVR	Role	Status
IVR-1	Submit Immediate Report (Vaccine)		X	HW	Passed
IVR-2	Submit Immediate Report (Non-Vaccine)		X	HW	Passed
IVR-3	Submit Immediate Report (Outbreak)		X	HW	Passed
IVR-4	Submit Immediate Report (Alt. Code 1)		X	HW	Passed
IVR-5	Submit Immediate Report (Alt. Code 2 and Discard)		X	HW	Passed
IVR_Null	Submit Null Report		X	HW	Passed
IVR_Operator	Operator Assistance (Leave Message)		X	HW	Passed
IVR_Send Message	Send Message		X	HW	Passed
IVR_Voice Mail	Review Voice Mail		X	HW	Passed
WEB-1	Login – Forgot PIN	X		HW, Analyst, DEC	Passed
WEB-2	Login – Wrong User ID	X		HW, Analyst, DEC	Passed
WEB-3	Login – Successful	X		HW, Analyst, DEC	Passed
HW_Home	Home Page	X		HW	Passed
WEB-1	Submit Null Report	X		HW	Passed
WEB-2	Clear Immediate Report	X		HW	Passed
WEB-3	Cancel Immediate Report	X		HW	Passed
WEB-4	Cancel Immediate Report from Confirmation	X		HW	Passed
WEB-5	Submit Immediate Report – Error Entry 1	X		HW	Passed
WEB-6	Submit Immediate Report – Error Entry 2	X		HW	Passed
WEB-7	Submit Immediate Report (Acute Flaccid Paralysis)	X		HW	Passed
WEB-8	Submit Immediate Report (Unusual Health Event)	X		HW	Passed
WEB-9	Submit Immediate Report (Outbreak)	X		HW	Passed
WEB-10	Submit Immediate Report (Alt. Code)	X		HW	Passed

Test Case Identifier	Test Case Name	Web	IVR	Role	Status
ANALYST_HOME	Home Page	X		Analyst	Passed
WEB-1	Check Messages – Send Email	X		Analyst	Passed
WEB-2	Check Messages – Forward Message	X		Analyst	Passed
WEB-3	Check Messages – Play Message	X		Analyst	Passed
WEB-4	Check Messages – Manage Folders	X		Analyst	Passed
WEB-5	View Immediate Reports	X		Analyst	Passed
WEB-6	View Immediate Reports – Download XLS file	X		Analyst	Passed
WEB-7	View Immediate Reports – Edit Reports	X		Analyst	Passed
WEB-8	View Immediate Reports – Negative Reports	X		Analyst	Passed
WEB-9	View Immediate Reports History	X		Analyst	Passed
WEB-10	View Immediate Reports – Graphs	X		Analyst	Passed
WEB-11	View Weekly Reports	X		Analyst	Passed
WEB-12	Maps	X		Analyst	Passed
DEC_HOME	Home Page	X		DEC	Passed
WEB-1	Submit Weekly Reports	X		DEC	Passed
WEB-2	Edit Weekly Reports	X		DEC	Passed
WEB-3	Update Immediate Reports	X		DEC	Passed

Annex 3: Telephone Interface User Survey Instrument (English and Arabic)

SMART
User Evaluation Form

Thank you for your participation in SMART and for agreeing to assess the software application that was developed to support disease surveillance and response for the Iraqi Ministry of Health. Ministry officials will be reviewing the pilot experience and the feedback received through this questionnaire and other sources to evaluate the usefulness and effectiveness of this program. As SMART users, your input is very valuable and greatly appreciated. Please use the back of the pages to complete or to add comments. Thank you.

1. **Have you used SMART?**
   Yes _____ No _____

2. **What have you done with SMART (check all that apply)?**
   - Submitted a disease report ____
   - Submitted a null report ____
   - Sent or received a voice mail ____
   - Other? ____ What? _____

3. **If you submitted a null report, how long do you estimate that it took (check one)?**
   Less than 1 minute _____ 1 minute _____ 2 minutes _____

   3 minutes _____ 4 minutes _____ 5 minutes or more _____

4. **If you submitted a disease report, how long do you estimate that it took (check one)?**
   Less than 1 minute _____ 1 minute _____ 2 minutes _____

   3 minutes _____ 4 minutes _____ 5 minutes or more _____

5. **How easy or difficult is it to enter data using SMART (check one)?**
   Very easy _____ Easy _____ Difficult_____ Very Difficult_____

6. **Of SMART's features demonstrated during training, how useful are the following features? Rate each feature with a number: 1 (very useful); 2 (useful); 3 (of little use); 4 (not useful). If you are unfamiliar with a feature, leave the space blank.**

   _____ Instant reporting of disease reports
   _____ Voice guiding and voice feedback responses during telephone reporting
   _____ Presenting information using maps (facility information, case reports, etc)
   _____ Voice mail
   _____ Automatic notifications of reported diseases to responsible officials
   _____ Displaying graphs to present disease reports

_____ Data export (through email or Excel)
_____ Other feature (Specify)?
_____)

7. **What do you see as the potential benefits of SMART? Rate SMART's potential contribution to each benefit with a number: 1 (very beneficial); 2 (beneficial); 3 (of little benefit); 4 (of no benefit). If you are unfamiliar with a benefit, leave the space blank.**

_____ Rapid transmission of data
_____ Ease of submitting detail disease reports
_____ Ease of access to technical, administrative and other information using voice mail
_____ Quality of information
_____ Analysis of disease reports
_____ Feedback to users and dissemination of information among users

8. **What potential concerns do you see in the use of SMART? Rate each concern/limitation with a number: 1 (high concern); 2 (moderate concern); 3 (little concern); 4 (no concern)**

_____ Connectivity
_____ Skill level of staff
_____ Quality of information
_____ Confidentiality of information
_____ Other concerns (Specify)?
_____

_____
_____

Please elaborate on any specific concerns/limitations:

_____
_____
_____

9. **What enhancements would you like to see made to SMART if any?**

_____
_____
_____
_____

10. **Was the training you received helpful in preparing you to use SMART? Check the one that applies to you.**

Very helpful _____
Helpful _____

Not very helpful _____
Not helpful _____

11. Were the training tools and materials provided helpful in using SMART? Check the one that applies to you.

Very helpful _____
Helpful _____
Not Very Helpful _____
Not Helpful _____

12. In your opinion how necessary were the support staffs?

Very necessary _____
Necessary _____
Little necessary _____
Not necessary _____

13. In your opinion how useful were the support staffs?

Very useful _____
Useful _____
Little useful _____
Not useful _____

14. Other observations and suggestion:

_____
_____
_____

سمارت
استمارة تقييم المستخدم

شكراً لك ولمساهمتك في تقييم **سمارت،** ولقبولك تقييم هذا النظام الذي صمم (لوزارة الصحة العراقية) من أجل مراقبة (انتشار) الأمراض واتخاذ التدابير اللازمة لمواجهتها.. سيقوم مسؤولون من وزارة الصحة بمراجعة (نتائج هذه الاستمارة)كي يقيموا جدوى وفعالية هذا النظام. وبما أنك استخدمت نظام **"سمارت"**، فإن إجاباتك ستكون ضرورية لهذا التقييم. الرجاء إضافة أي تعليق حول إجاباتك على الصفحات المرادفة. شكراً جزيلاً.

1- هل استخدمت نظام **"سمارت"**

نعم _____ لا _____

(إذا كان الجواب نعم، الرجاء إجابة الأسئلة التالية:)

2- ماذا عملت (كان دورك) مع **"سمارت"؟** (ضع إشارة جانب القسم اللازم)

_____ قدمت تقريراً يتعلق بمرض ما
_____ قدمت تقريراً سلبياً (لاغياً - Null)
_____ أرسلت أو استلمت رسالة صوتية
_____ شي آخر

ما هو _____

_____

3- إذا كنت قد قدمت تقريراً سلبياً (لاغياً-Null)، كم من الوقت لزمك لتقديم مثل هذا التقرير؟ (ضع إشارة على واحد من الخيارات التالية):

أقل من دقيقة _____ دقيقة واحدة _____ دقيقتين _____
ثلاث دقائق _____ أربع دقائق _____ خمس دقائق أو أكثر _____

4- إذا كنت قد قدمت تقريراً يتعلق بحالة مرض ما، كم من الوقت لزمك لتقديم مثل هذا التقرير؟ (ضع إشارة على واحدة من الخيارات التالية)

أقل من دقيقة _____ دقيقة واحدة _____ دقيقتين _____
ثلاث دقائق _____ أربع دقائق _____ خمس دقائق أو أكثر _____

5- كم كانت سهلة أو صعبة عملية إدخال المعلومات باستعمال **"سمارت"؟** (ضع إشارة على واحدة من الخيارات التالية)

سهلة جداً _____ سهلة _____ صعبة _____ صعبة جداً _____

6- كيف تقيم فائدة خصائص **"سمارت"** التي شملها التدريب؟ ضع رقماً مناسباً: 1 (مفيدة جداً) 2 (مفيدة) 3 (مفيدة قليلاً) 4 (ليست مفيدة). اترك فراغاً لكل خاصة ليست لديك خبرة بها أو لم تستعملها.

_____ ارسال تقرير فوري عن أمراض
_____ الارشادات الصوتية والاجابات عليها أثناء تقديم التقرير
_____ عرض المعلومات عند تقديم ا لخرائط (المراكز، التقارير عن الحالات ...الخ)
_____ البريد الصوتي
_____ أرسال الاشعارات اتوماتيكياً للمسؤولة عن حالات الأمراض
_____ عرض الملومات لتقييم جداول بهذه الحالات
_____ توريد المعلومات عن (طريق البريد الالكتروني، جداول Excel)
_____ أخرى؟ ما هي؟

خصائص_____

_____

7- برأيك ما هي الفوائد الممكنة من خلال استعمالك نظام **"سمارت"** وما هي ميز (ميزات) **"سمارت"؟** ضع رقماً مناسباً لكل من المميزات التالية: 1 (مفيدة جداً) 2 (مفيدة) 3 (قليلة الإفادة) 4 (عديمة الفائدة) اترك فراغاً للميزة التي لا تعلم عنها.

_____ إرسال المعلومات بسرعة
_____ سهولة تقديم المعلومات المفصلة
_____ سهولة الحصول على المعلومات التقنية، الإدارية أو معلومات أخرى عن طريق البريد الصوتي
_____ نوعية المعلومات
_____ تحليل تقارير الأمراض
_____ إعلام المستعملين بنشر المعلومات

8- ما هي تحفظاتك المحتملة على استخدام نظام **"سمارت"** ؟ ضع رقماً مناسباً 1 (تحفظ عالي) 2 (تحفظ معتدل) 3 (تحفظ قليل) 4 (لا تحفظ)

_____ الاتصالات
_____ خبرة الموظفين
_____ نوعية المعلومات
_____ سرية المعلومات
_____ تحفظات أخرى (ما هي بالتحديد)؟

_____

_____

الرجاء شرح هذه التحفظات الأخرى التي حددتها: _____

9- ما هي التحسينات التي تقترح إضافتها لنظام "**سمارت**"؟

_____

_____

10- هل كان التدريب الذي شاركت به على نظام "**سمارت**" مفيداً ومساعداً لك على استخدام (هذا النظام) "**سمارت**"؟ اختر خياراً من الخيارات التالية:

_____ مفيد جداً
_____ مفيد
_____ مفيد قليلاً
_____ غير مفيد

11- هل كانت مواد التدريب مفيدة لاستعمال "**سمارت**"؟ اختر واحدة من الخيارات التالية:

_____ مفيد جداً
_____ مفيد
_____ مفيد قليلاً
_____ غير مفيد

12- برأيك الموظفين المساعدين

_____ ضروريين جداً
_____ ضروريين
_____ ضروريين قليلاً
_____ غير ضروريين

13- برأيك الموظفين المساعدين

_____ مفيدين جداً
_____ مفيدين
_____ مفيدين قليلاً
_____ غير مفيدين

14- ملاحظات واقتراحات اخرى:

_____

_____

15- برأيك الموض

_____ غير ضرورية على الإطلاق
_____ ضرورية
_____ ضرورية قليلاً
_____ غير ضرورية على الاطلاق

16- الموظفون المساعدون

_____ غير مفيدين على الإطلاق
_____ مفيدين
_____ مفيدين قليلاً
_____ غير مفيدين على الاطلاق

17- الرجاء إكمال المعلومات الشخصية التالية:

كم هو عمرك: _____

ما هي وظيفتك: طبيب _____ ممرض؟ممرضة _____ وظيفة أخرى _____

الجنس: مؤنث _____ مذكر _____

هي لديك عنوان بريد الكتروني (E-mail): نعم _____ لا _____

هل لديك هاتف خلوي؟ نعم _____ لا _____

هل لديك حاسوب في منزلك؟ نعم _____ لا _____

Annex 4: Results of Telephone Reporter Survey

SMART

Health Worker Survey

1.	**Have you used SMART?**	yes	no	
		29	0	
2.	**What did you use SMART for?**			
		Disease report	12	
		Null report	24	
		Voice mail	9	
		other	3	
3.	**If you submitted a null report, how long on the average did it take?**			1.875 minutes
4.	**If you submitted a disease report, how long on the average did it take?**			3.588 minutes
5.	**How easy or difficult was it to report diseases using SMART?**			
		Very Easy	0	
		Easy	26	
		Difficult	2	
		Very Difficult	1	
6.	**Rate the usefulness of SMART's features (leave blank if you aren't familiar with feature)**			
	Instant reporting	very useful	23	
		useful	4	
		of little use		
		not useful		
		no answer	2	
	Voice prompts	very useful	14	
		useful	5	
		of little use	2	

	not useful	1
	no answer	7
Maps	very useful	3
	useful	4
	no answer	22
Voice Mail	very useful	6
	useful	4
	of little use	
	not useful	
	no answer	19
Notifications	very useful	5
	useful	
	of little use	1
	not useful	
	no answer	23
Graphs	very useful	1
	useful	2
	no answer	26
Data export	very useful	1
	useful	1
	of little use	1
	no answer	25

7. Rate the potential benefits of SMART

Rapid transmission of data	very beneficial	25
	beneficial	3
	of little benefit	
	of no benefit	
	no answer	1

Ease in reporting	very beneficial	21
	beneficial	4
	of little benefit	
	of no benefit	
	no answer	3
Access to tech info	very beneficial	7
	beneficial	7
	of little benefit	1
	of no benefit	
	no answer	14
Data quality	very beneficial	7
	beneficial	3
	of little benefit	2
	of no benefit	
	no answer	17
Analysis of disease reports	very beneficial	4
	beneficial	6
	of little benefit	
	of no benefit	
	no answer	19
Feedback to users	very beneficial	5
	beneficial	6
	of little benefit	1
	of no benefit	
	no answer	17
Rapid disease identification	very beneficial	4

		beneficial	3
		of little benefit	
		of no benefit	
		no answer	22

8. What are your concerns about the use of SMART?

Connectivity	high concern	7
	moderate concern	7
	little concern	5
	no concern	7
	no answer	3
Skill level	high concern	2
	moderate concern	5
	little concern	7
	no concern	8
	no answer	7
Data Quality	high concern	4
	moderate concern	5
	little concern	5
	no concern	11
	no answer	3
Data security	high concern	4
	moderate concern	3
	little concern	3
	no concern	9
	no answer	10

10. How helpful was the training you received in using SMART?

Training	very helpful	18
	helpful	10

	not very helpful	
	not helpful	
	no answer	1

11. How helpful were the training tools and materials provided?

Training tools/materials	very helpful	15
	helpful	11
	not very helpful	3
	not helpful	
	no answer	

12. How necessary were the user support agents?

very necessary	8
necessary	13
not very necessary	5
not necessary	2
no answer	1

13. How useful were the user support agents?

very useful	6
useful	14
of little use	4
not useful	2
no answer	3

DEMOGRAPHICS OF RESPONDANTS

ages		28-52
professions	doctors	26
	bacteriologist	2
	no answer	1
gender	female	6
	male	22

	no answer	1
personal mobile phone	yes	11
	no	16
	no answer	1
computer at home	yes	8
	no	20
	n/a	1
email address	yes	8
	no	20
	n/a	1

12. Other Comments

Provide the doctors who are responsible for the program with a mobile phone.
Same as article 9 due to the difficulty of a fixed appointment with the support staff.
Organize additional training courses on how to use Smart Program and provide each PHS with P.C and internet.
Technical problems of mobile devices and net work problems cause lack of the flow in information.
Communicate from the PHS directly and not as organized groups that have to move from a location to another that causes interruption in the participants work and facing dangerous on the road.
This program was implemented in one district so that the requirements are limited for its success, but these limited requirements could still not be achieved due to the limited of communication needs that resulted in lack of providing the information causing unnecessary interruptions for the doctors because of the difficulty of transportation and causing lack in their duty at PHCs.
Training the participants on how to use the P.C and internet and use the P.C in the PHCs to perform all process that Smart program includes.
Communicate from the PHS directly and not as organized groups that have to move from a location to another that causes interruption in the participants work and facing dangerous on the road.
Expand the implementation of the program to the country
Greater financial support for the program.
Improving the network to avoid communication difficulties.
Listed diseases are not enough, please add other important diseases.
Re-arrange the list of disease so that could be more practical and include the more common diseases.

9. Suggested Enhancement

Provide a mobile phone for every doctor responsible for the Smart program so that he can send and receive messages to and from the supervisors in the CDC.
Distributing mobile phones to all the participants and not only to the support staff that are only 2 and the total participants are 24
Include additional disease
Immediate follow up specially the recorded voice
Increase number of mobile phone
Provide more efficient mobile devices to all the participants that will minimize costs and efforts, also suggest postponing the implementation of the project if success achieved until communication capabilities are improved to insure the success of the program.

Technical issuing only
Add other disease to the list
Organize them geographically
Organize training courses on how to use the P.C. and provide PCs to all PHCs and link them to the internet and also to update the participants on any new information.

Increase numbers of mobile phones in order for the system be efficient.
Fix use land lines
Service provider to be based in Iraq
Voice mail to be in a more clear speech
Adding the communicable disease that are more prevalent
Adding new items concerning treatment and how to avoid spreading
Provide mobile phones to all the participants
Use the P.C. to save and send information
Smart program to be independent in the PHCs and not related or mixed with any other programs
Distributing mobile phones to all the participant
Include other communicable diseases within the system
Giving immediate report when there is an actual disease and not using null
Enhance the network
the communication should be local
supply the users with ear pieces

Support program include cases that are not practical

Smart program is a very good and useful, the only problem is the difficulty of communication, we are hoping for improvement to communicate with the program.
I support providing mobile phones to all the participants.
Organizing training courses on regular bases to update the participants on any new and useful information.
Provide mobile phones for all the participants.
Provide a P.C. to each PHC
Smart consists of a variety of disease that are not common at the PHCs, I think the diseases shall be expanded to meet the actual need of diseases found in the PHCs like chicken pox, typhoid, Malta fever, brucellosis and mumps

Adding diseases to the program and distributing additional mobile phones.

Decrease the number of questions during the phone call in order to limit call duration.
I suggest at the end of the report, the number will be repeated usually it is hard to hear the number of the report in order to confirm we have to re do the whole process.
I think it is possible to improve Smart Network by improving the performance of the answering the voice because it is usually not clear and it is hard to hear the report number.

Increase number of the mobile and include additional diseases to the list.

Organize more training courses and improving the program.
Provide a server in Baghdad to help improve communication
Strengthening the voice of Smart program.

Annex 5: Web Interface Virtual Group Interview Notes

SMART Assessment
Managers/Web Users Group Interview

5 May 2004

Interviewers: George Scharffenberger, Voxiva
Dr. Pamela Johnson, Voxiva

Interviewees: Dr. Munir Kubba, MoH/CDC Iraq
Dr. Adnan Anwar , MoH,CDC/Iraq
Dr. Hanaa Bahjet, MoH/Karkh Health Directorate

Technical Support: Mousa Alzeyadaa, Abt Associates

Five Suggested Topics of Inquiry:

1. What was done with the system/how used
2. Usefulness/limitations now and potential in future
3. How functions could be changed
4. Changes in data collected/how it is presented
5. Recommendations relative to possible expansion

Use during pilot:

Dr. Mounir: No other questions.

Used to look at reports coming from the Karkh District. Not used much for analysis since it was just in Karkh plus the technical difficulties in Karkh. Identified outbreak and investigated to verify that there was a mumps outbreak. There was a problem with the voice (audio) function of my computer but were able to verify.

Very fast notification and that's very important for surveillance and response in Karkh or anywhere.

Adnan: Used SMART to make a graph of measles. Sent it to Voxiva. Very good analysis, easier notification. Problem was with voice but now that is ok now that Java has been reinstalled. During this period only tested the training of health workers. Because the reports were being made to Washington servers, it was not possible to test the servers in Baghdad. Want to know when the servers will be available. Very important for future that the servers can be activated in Baghdad.

Hanaa: Very useful program for our district. Limitation relative to paper-based. In future will be better. Most important problem is technical – not with health workers. Transportation of workers. Taken in group to make reports. Connection with internet not possible from my district office. Had to go to Dr. Munir's office to see reports. HW are all grateful and happy with it but limited. Need to be more progressive. Hope that server in Iraq will work and that we can use ordinary telephones.

Scharffenberger: Mumps outbreak: Outbreak reports. Was it useful way to learn about mumps? How responded to?

Munir: Important not mumps but unusual event needs to be notified as soon as possible. Through this we got the information next day, not days later. This is very important. But problem with voice, didn't know what was outbreak. We got information that it was mumps. Don't have a way to control outbreak – vaccination, etc. But other diseases could be responded to. Diphtheria, hemorrhagic fever, etc. for example would need to respond quickly. Technical problems – mobile phones used by group and problems with mobile system. Not so good. If have good communication system or somewhat good, I think that it will be much better than paper. Needs someone to carry. Takes time. And there is a security problem. With now, this will make a big difference. Now getting email information from some governorates. With this we can overcome the problem of security.

Automatic notifications? Not used. Problem with telephones. Don't have microphone to talk to computer. But most of problems not in system, rather in communications technology not in system.

Scharffenberger. Difficult but hopefully one that will improve.

Server in Baghdad is actually working and working well. Voxiva uses it for testing and for demonstrations. Working very well. But haven't been able to connect to telephone system. Very close to resolution. Establish gateway at working exchange. Almost completed but bomb in ITPC keeps from making connection. Hope that will be functioning in 2 weeks.

Adnan: SMART easier, faster , more info and more accurate. Mumps: not actual outbreaks but trainees want to use to report as outbreak. Munir: was an outbreak but not in code so need to use outbreak.

Need weekly collective reports. Very important. SMART should be done using regular plus mobile phones.

DJ: What are constraints to using ordinary phones.

Munir: Many exchanges have been destroyed. Not sure when it will be completed.

Munir: Modifications: Need collective weekly report.

[Look at system via WebX]

Home Page:

Scharffenberger Describes elements. Looks at April.

What other information like this would they like to see on home page?

Munir: For the expanded program? Maps should be over whole country with governorates. But map of each governorates to show where cases are there. If expand, need to show map of whole country but also need map of governorates with districts showing where cases are. For graph: can change to be better? Age groups: pie charts. Also for gender.

Scharffenberger: Purpose of Home Page is to summarize data.

Immediate Report Page: selection feature. Make graphs. These can be changed to different types of graphs. They should start talking/thinking about what kinds of graphs they would like to see. Measles graph of Dr. Adnan was very impressive.

Weekly reports: It exists. Form is made for internet, not telephone. That is something that can be re-visited. Other diseases would appear. Munir: If go to whole system all diseases will be on a weekly basis. So weekly basis should be used only numbers, age group and sex. Needs to be discussed later.

Immediate notified reports can automatically appear in weekly report so doesn't have to be reported in weekly report. Would be included automatically.

Maps: Looked at them. Health facilities shown. White block shows where there have not been reports. But there is one facility that did not report. Dr. XXX. Al Washash. Can be used to help to get in touch with those not reporting to see if there is a problem. Can see who is reporting and who is not.

Hanaa: HW now have good experience with system. Previous technical problems – calls cut but now easier. Can do reports in one call. Just the technical problems are the issue. Now they have an easy way to do a report. If there is not report that would be the only reason for no report. Supervisor goes around to see if there are problems and they report to me every day. They report to me. The only thing they need is cards to call.

Munir: Very interesting. Most are doing reports. Only one didn't report. In our notifications we don't get this high level of reporting. 28 out of 29. This is very good. Tomorrow I will check with Al Washash since it is near by the office.

Johnson: Also impressed with such as high level of reporting. People now find it easier, as you say and there must be good supervision.

Munir: Especially in Karkh. With all the communication problems in Karkh this is impressive. When they have regular phone service it will be even better.

Hanaa: Health workers have met with them before the questionnaire. They are very happy with using the system. Each one wants to do the reports themselves. That way they got experienced. Once the supervisor was late but they said that they wanted to do it themselves. Very experienced now.

Scharffenberger: We can see that the time to make reports is shortening.

Munir: I think so. Next step will be when the District and Karkh Directorate and CDC we can see reports and give feedback with two-way connection. If they don't report we will know. If they report something that needs more information, we can contact them to find out more through the system. Through this we will have better reporting.

Scharffenberger: Shows map and discusses how it might look when all the country is included. Zoom in on Erbil, for example.

Johnson: Any other changes or modifications? Things that would be important to change?

Munir: In system or information?

Johnson: Either

Munir: I sent email with some of the changes and with all the districts except Sulymanai. We want some changes in diseases. We need more diseases for immediate notification. Also changes in translation to Arabic. There are some problems with the translation.

Scharffenberger: Received. Please send the Sulymaniya district.

Munir: I will send all the districts including Sulymaniya.

Scharffenberger: What other changes would you like to see?

Hanaa: Most important is to link everyone to the report in their district. How to go to another place to do reporting. Problem is with financing of trips. Want funds to travel. This is problem now.

Scharffenberger: Technical problems are ones that need to be focused on. These are not things that Voxiva can do much about but we hope that as the telephone system is repaired these problems will be resolved and everyone will be able to report from their own post. This is how it is supposed to be.

Hanaa: Still problem with computer. Can't access Iraq SMART. I need someone with experience to look at my computer. I have his number.

Scharffenberger: Najati or Mousa can perhaps help.

Munir: For Dr. Hanna. For the pilot. We need codes for governorates as well as for districts. I sent names of immediately notifiable diseases that need to be collected. Also for weekly collective reports of diseases. With the data needed. No more information needed for immediate – just change in translation.

Scharffenberger: Future. Pilot. Steering committee will look for recommendation for what should happen next. What would you recommend to Steering committee? If you seem to be talking about making it a national system. How to make that happen? What are steps? What are challenges?

Munir: I recommend this project. It will help getting info/data from the all the governorates easier, simpler and faster. That is very important for surveillance. We won't be able to do it all in one night. We can go by steps. Start with the Karkh Directorate since that is where the pilot started. Then go to the rest of Wasafa (compete all Baghdad). Then we can move to other governorates – Basrah Mosil, Erbil and maybe Hilla, We should go be steps – complete one area and the move on to second then the third. We should do one or maybe two governorates at a time. The main problem we have is technical – the telephone. How to communicate between all the areas? We can now call some of the governorates by phone and maybe get some connection. The second problem is training. Training is very important in many subjects. How to use phone? What are the codes? Then, when we have computers and the internet in the governorates and the districts will be how to use the internet, email? The third problem is maintenance. We will need maintenance of all the equipment and the need for backup for users. We are not all good users. We need someone to advise us on these problems that we will have. Sometimes we have problems that we don't know how to resolve. These are the problems that we will face for the expansion in addition to the major problem which is security.

Scharffenberger: Others have anything to add or expand?

Adnan: One suggestion: Coding of governorates. Is it possible to give for example Baghdad the code of 1. And then a district of Bahdadad 1.0, 1.1, 1.2, etc.

Scharffenberger. That is helpful but the codes that we used are those of existing codes in Iraq for different area?

Munir: In phone system?

Scharffenberger: The number we used we got the numbers from administration/CPA – from former/existing system of codes for districts.

Munir: I think that they have communication/phone codes. Baghdad for instance is code 1. With the districts having other codes. In Wasafa for example, 601, 601, etc. These are the codes of what we call mahala. These are not the health districts. The health districts sometimes differ from the administration districts. For example: In Baghdad hey put Karadah. This is not a health district. It is a suburb and an area of Wasafa. The health district is not identical to the health district. They are sometimes different, except in the north.

Scharffenberger. If you know we had this discussion. Because of differences between health districts and administrative districts, I hope that we solved this by using both in the reports. The system can print out tables and graphs based on the health districts. . But for maps, we need mapping done by administrative districts since we have not been able to find maps of health districts for the nation. But this is something that we can work on during the expansion.

Munir: I hope that you can reach a solution for this difference, please tell us. This is not just for maps. We have the same problem for Population which is only available for administrative districts. When we go to Planning statistical, there information they also give it to us by district. We need a solution.

Scharffenberger: This is a major problem faced by other countries in the region. The easiest solution is to agree on one set of boundaries. In most cases the easiest is to use the administrative boundaries since this is how most statistics and services is organized. This requires a different kind of organization within the services within those since the administrative boundaries might not correspond to population or other service needs. There are all sorts of issues but there is no easy answer.

Scharffenberger: A few more things I would like to ask. Send greeting of Saad Aboul Nasr.

Munir: Thank you. Please send him our wishes. We hope to see him again in Baghdad. We really appreciated his help. He really helped us a lot. He was very enthusiastic.

Hanaa: He made many efforts in our district with the health workers. I also send him my greetings and thanks.

Scharffenberger: I know that it was very difficult for him to have to leave so suddenly without being able to see you. He was sad to leave. I know that he also is hoping to return.

Munir/Hanaa/Adnan: We hope so.

Scharffenberger: We now have email addresses for Munir and Adnan but not Dr. Hanaa.

Hanaa: I will send it with Ahmed Najati.

Scharffenberger: Any other comments, recommendations, questions.

Hanaa: If you expand to Al Ahadmiya district, I will be able to expand SMART there since my general manager insists on sending send me there to make improvements. If you plan on that, I will agree. If not, I will miss you.

Scharffenberger: Wherever you go, SMART will follow you!

Munir: So you will have to expand to X.

Hanaa: They are using me to go to areas where they want to see improvement.

Scharffenberger: I would do the same thing! I might even send you to anywhere in the world.

Munir: Perhaps you should take her to Rwanda?

Scharffenberger: Be careful, we might want to send her to CDC.

Munir: Will program end I May?

Scharffenberger: Let me tell you what I know and then we will keep in touchy. As you are aware, the program is funded by USAID. USAID gave a contract to Abt and Abt then gave the contract to Voxiva. Voxiva's contract is ending this week but we have talked to Abt and they have agreed to make sure that the Karkh pilot continues and they will provide phone cards through June and maybe July. They are committed to keeping it going. The two assistants in Karkh will be available to help through May but after May I think that by then you will be so well trained that you will not need them. We are waiting to hear whether USAID will again give a contract to Abt to do the next phase of the large health program. If they do, Abt has said that they would like Voxiva to continue with them, if it is the wishes of the Iraqi ministry of health, and work with them on an expansion but that depends on the MoH. The MoH must request that.

Munir: Should we start something now to recommend expansion of the program?

Scharffenberger: It would be helpful. As you know, increasingly the CPA is handing over authority to Iraq. At the end of June full authority will be handed over to the Iraqis. So it is important for the future that, if this is something that you want, the MoH at your level but also Dr. Niima and perhaps the Minister are made aware and express their desire to continue this.

Munir: I heard that the minister has great interest in this project. Should we wait for the survey before sending the recommendations?

Scharffenberger: When will the survey be completed?

Hanaa: The end of this week, maybe tomorrow.

Munir: That is next week.

Scharffenberger: We will ask our colleagues of Abt to take them and send them or perhaps they will transcribe the results or send them to our colleagues in Beirut. This conversation, the surveys and everything will go into our draft report to you and the steering committee. We hope to send that to you at the end of next week.
Hanaa: So we will wait for two weeks for the complete draft of the project assessment and then we will make our recommendations.

Scharffenberger: And then my understanding is that the steering committee would then look at the report and make their recommendation based on the report.

Hanaa: OK

Scharffenberger: Anything else?

Thanks expressed on both sides.

Annex 6: External Expert Functional Assessment Questionnaire

External expert review of SMART software (features and functionality)
Suggested Review Outline

Thank you for agreeing to review the software application that we have developed to support the Iraqi Ministry of Health as a sub-contractor to Abt under contract to USAID. The software specifications and customization features were developed under guidance of the Iraqi Ministry of Health with input from WHO, CDC, NAMRU and others. Despite the challenges of the current situation, the software is currently being used on a pilot basis in the Al Karkh Health District of Baghdad and the application that you will be reviewing is operating on servers in Baghdad.

We greatly appreciate your willingness to access the system to review the features and functionality of the application and to make recommendations for its improvement. Though the focus of this review is not on the disease lists or the specific data being reported, we would welcome comment on these as well and will pass them on the Iraqi Ministry of Health.

We would appreciate your thoughts on the major "pages" of the application:

- Log-in (where you should enter the log-in information supplied by email)
- Home (You are logged-in with a "Global Analyst" role, eg. you will have access and a view of data similar to that of a key ministry official responsible for disease surveillance and response in Baghdad. What you will see on your homepage is a simple "dashboard" summarizing recent data in the system. A more complex dashboard can be designed to help MoH officials get an instant update of the situation as they log-on each day. You will notice place holders for Basra. Originally Basra was to be included in the pilot.)
- Immediate reports (a tabular view of case reports – or null reports – sent in by facility-level health workers. Reports can be sorted, selected, exported, etc.)
- Graphs (the number of selected disease reports can be presented in simple bar graphs, representing daily, weekly or monthly cases)
- Weekly reports (aggregate case numbers of important communicable diseases not included in the list of immediately reportable diseases are listed by age and gender. They can be aggregated in several ways. Please note that the graph function for the weekly reports has not been made functional on the current version.
- Maps (the location of disease reports can be viewed on a map. Location of reporting facilities can also be shown. More complex mapping, such as using different colors to indicate varying prevalence rates, is possible for future versions of the Iraqi system).
- Administration (where the user can change her/his profile, immediate notifications, etc.).

Your feedback and suggestions are requested as individual professionals in order to help guide improvements in the system should the Iraqi Ministry of Health decide to continue and expand the existing pilot. We **are not** seeking an endorsement by you or by your institution for Voxiva or for the SMART system. If you would prefer that your comments not be attributed to you, please so indicate.

The data that you will be viewing as you review the system is simulated data that roughly parallels the actual disease reports being entered by health workers in the Karkh district of Baghdad. For obvious reasons it is not the actual data. The numerous "null" reports reflect an

important feature of the system and how it is being used by the MoH. Null reports are used to confirm that reporting is taking place while indicating the absence of a reportable disease in the reporting district (as opposed to the more ambiguous situation if no report at all were received).

The following are suggested questions to guide your review. Please feel free to make additional comments that come to mind. Many thanks again for your assistance.

1. **How useful do you see the following features of SMART. Rate each feature with a number: 1 (very useful); 2 (useful); 3 (of little use); 4 (not useful). If you are unfamiliar with a feature, leave the space blank.**

____ Real time reporting of disease reports
____ Ability for telephone-based reporters to add a voice clips to expand on or contextualize their report
____ Voice prompts for telephone based-reporters
____ Repetition of key data entered by telephone users to validate/confirm entries
____ Voice mail
____ GIS/Mapping (facility information, case reports, etc)
____ Automatic notifications when user-specified diseases are entered into the system
____ Automatic graphing
____ Data export (email, Excel)
____ Administrative interface
____ Other (specify)

Comments:

2. **What do you see as the potential benefits of SMART? Rate SMART's potential contribution with a number: 1 (very beneficial); 2 (beneficial); 3 (of little benefit); 4 (of no benefit). If you are unfamiliar with a benefit, leave the space blank.**

____ Rapid transmission of disease reports
____ Compliance with official disease reporting requirements
____ Data quality
____ Heath worker access to technical, administrative and other information (using voice mail)
____ Analysis of disease report data
____ Timely feedback to health workers responsible for reporting
____ Communication/networking
____ Rapid identification and response to outbreaks
____ Data security
____ Other (specify)

Comments:

3. **What potential concerns/limitations do you see in the use of this application in Iraq? Rate each concern/limitation with a number: 1 (of high concern); 2 (of moderate concern); 3 (of little concern); 4 (of no concern).**

____ Inadequate laboratory support

____ Connectivity
____ Skill level of targeted users
____ Ambiguity/inadequacy of case definitions
____ Data quality
____ Other (specify)

Please elaborate on any specific concerns/limitations:
_____
_____

4. What feature/functionality enhancements would you recommend to the MoH?

____ Direct export of data into EPI-info or other programs. Which one(s)?
_____
____ Additional GIS layers (locations of schools, roads, etc) Which one(s)?
_____
____ Telephone-accessible information menu for case definitions
____ Telephone-accessible information menu for diagnosis or treatment guidelines
____ Telephone-accessible information menu for other information (What?)
_____
____ Additional data quality checks (please describe)_____
____ Additional flexibility to modify disease lists
____ Additional built-in analytical ability (please describe) _____
_____
____ Ability to create/implement ad hoc questionnaires
____ Other?

Which of these enhancements would you consider to be the most important?

Other comments regarding suggested enhancements:

5. Other comments regarding features/functionality?

6. Recommendations/comments/guidance regarding the possible expansion of SMART to a nation-wide system:

Annex 7: External expert review of SMART software (features and functionality)

RESPONSE SUMMARY

As part of SMART pilot deployment assessment process, the company invited five public health information technology experts to review the SMART disease surveillance system launched in Iraq. Voxiva asked the reviewers to assess the features and functionality of the demonstration system only because it is against Voxiva's privacy policy to allow outside users to access live data. The experts received a review sheet to guide their comments, with significant space for free response. The review sheet included numerical rankings of features (existing and future), benefits, and limitations by importance, as well as text fields for expanding on those rankings.

The three features that received across the board recognition as most critical were: automatic notifications, automatic graphing, and data export. Voice mail received the lowest marks, though three users still ranked it as "extremely important," one of whom selected this feature as one that could benefit the health system (this feature was not available for test in the demo). In addition, the experts highlighted the ability to manipulate the disease list, and the desire to have a system that could highlight reports of extremely important diseases (CCHF, inhalation anthrax) on the main page as existing features they would like to see enhanced.

With respect to the potential benefits of SMART, experts ranked the rapid transmission of disease reports as being "extremely important" across the board. All of the other system features received favorable rankings, with one expert commenting that "rapidity and a reasonable amount of data" are key. Data quality was noted as the area in which Voxiva system would contribute the least benefit, though the expert reviewers indicated that this was because data quality depended so heavily on the staff using the system, rather than on the system itself.

Connectivity was seen as the greatest limitation to the utility of the system, with inadequate laboratory support as another key concern. Again, concerns about the laboratory support reflected broader concerns about data quality, not necessarily related to the Voxiva system: "The quality of the data is going to depend more on the diagnostic capabilities of the facility staff and laboratories than the means of reporting. The system should help central level staff notice if an outbreak with cases in several different facilities may be in process and to consequently initiate a respone [sic]." This highlights the important connection between the function of the system itself and the workflow that surrounds it, both of which must be understood in order to create a successful deployment. In addition, several reviewers had comments regarding the layout of bar charts and graphs, requesting that the title be written in larger type for clarity, and that charts should be flexible to include different time frames, or other variables such as gender and age.

Across the board, experts recommended increased ability to modify disease lists as the most important function to add, though some also cited adding GIS layers and improving

data export functionality as important. One reviewer suggested that a security-related overlay to the GIS data would be a valuable boost to Iraqi epidemic response efforts, as this is certainly a dimension of epidemiological response in Iraq at this time.

Though the experts pointed out important ways in which features and functionality can be enhanced and the workflow surrounding the system examined, the overall response to SMART was enthusiastic. One reviewer expressed support for the national rollout of SMART in Iraq, saying, "CPA is interested in helping the MOH develop a national computer based national reporting system. SMART could/should be incorporated into the planning." And another expert noted, "SMART allows competent authorities to access data in a rapid, organized and analytical manner. My opinion is that current features provide the required tools to identify outbreaks and analyze evolution of health priorities."

Voxiva wishes to thank the expert review board for taking the time to conduct such a thorough and thoughtful review of the SMART disease surveillance system.

International Expert Review Data

	EXPERT # 1	EXPERT # 2	EXPERT # 3	EXPERT # 4	EXPERT # 5
Utility of SMART features					
Real time reporting of disease reports	1	2	1	1	1
Ability for telephone-based reporters to add voice clips to expand on or contextualize their report	1	1	1		1
Voice prompts for telephone based-reporters	1	1	1		1
Repetition of key data entered by telephone users to validate/confirm entries	1	1	1		1
Voice mail	1	2	1		1
GIS/Mapping (facility information, case reports, etc)	1	2	1	1	1
Automatic notifications when user-specified diseases are entered into the system	1	1	1	1	1
Automatic graphing	1	1	1	1	1
Data export (email, Excel)	1	1	1	1	1
Administrative interface	1	2	1	1	*** wasn't functional for me to test*

	EXPERT # 1	EXPERT # 2	EXPERT # 3	EXPERT # 4	EXPERT # 5
Comments	I think the flexibility to modify the list and the type of information needed according to the epidemiological situation is important to be sure that we are collecting the data that is important and for the diseases which are affecting the public health situation.	Unless the system is going to be monitored on a continuous basis at the central level, some reports are best conveyed directly via telephone to the MOH. (e.g. very large, sudden outbreaks of disease or cases of possible terrorism). Reports of some cases of disease (CCHF, inhaltional anthrax) should be highlighted on the front page so that viewers will notice immediately. It would be nice if you could change the data that are graphed. For example, instead of number cases in a certain time period, looking at the cases by age or sex might also be useful. I know you can export the data and manipulate it in another program.		I did not have the opportunity to use the phone reporting, but do find it the most impressive feature of the system, particularly the possibility of sending voice messages and receiving similar feedback	*I cannot address a number of the questions placed above in practical terms, but have addressed them in terms of theoretical terms, with a knowledge of how a similar system (Alerta) has functioned in Peru. The demo access does not include the voice mail functions and does not allow for a demo data entry routine to see what the data enterer actually encounters. That being said, having looked at the Alerta system in Peru and seen how the actual data entering functions, I would assess the value off the SMART system as "1" across the board.*

	EXPERT # 1	EXPERT # 2	EXPERT # 3	EXPERT # 4	EXPERT # 5
Potential Benefits of SMART					
Rapid transmission of disease reports	1	1	1	1	1
Compliance with official disease reporting requirements	2	1	2	1	1
Data quality	2	2	1	2	1
Heathworker access to technical, administrative and other information (using voice mail)	1	2	1	1	1
Analysis of disease report data	1	1	1	1	2
Timely feedback to health workers responsible for reporting	1	2	1	1	1
Communication/net working	1	2	1	1	1
Rapid identification and response to outbreaks	1	1	1	1	?
Data security	2	2	1		?
Other (specify)					

	EXPERT # 1	EXPERT # 2	EXPERT # 3	EXPERT # 4	EXPERT # 5
Comments	Rapidity and a reasonable amount of data on each case is very useful	The quality of the data is going to depend more on the diagnostic capabilities of the facility staff and laboratories than the means of reporting. The system should help central level staff notice if an outbreak with cases in several different facilities may be in process and to consequently initiate a response.		The level of laboratory development and capacity is not very clear in the information I received, but it is evident from the reported cases that there is an important percentage of clinical diagnosis. In order to improve data quality for many of the reported diseases, it is mandatory to implement appropriate lab diagnostic procedures for confirmation of clinical presentation. Data quality also depends on the amount of work assigned to the responsible person, considering number of diseases to be reported I would require further orientation on the tasks to be completed in order to have an opinion on the issue. In general, initiating with less diseases, concentrating on the preventable ones and growing from there would be ideal. Reporting of STDs specifically could be reviewed. In my brief understanding of the context, reporting (and treating) by syndromes would be advisable.	*Again, it is hard to assess the SMART system in "real time" in terms of data collection etc, and in terms of data quality in the absence of seeing real data and going out to the reporting facility to check on the quality and use. Most of my interpretations are based on the practical knowledge of a similar system (ALERTA) in Peru. One does question how much this will impact on the rapid identification and response to outbreaks. An arm chair review is not possible as there are no data to permit an assessment (this would include additional data fields on date of onset of all cases in the reported outbreak, date of report, date of investigation, levels of attention of the health sector involved in the investigation, and findings of investigation. As for data security, I cannot address the actual security level of this system.*

	EXPERT # 1	EXPERT # 2	EXPERT # 3	EXPERT # 4	EXPERT # 5
Potential Limitations					
Inadequate laboratory support	1	1	2	1	2
Connectivity	1	1	1	1	1
Skill level of targeted users	1	2	2	3	?
Ambiguity/inadequacy of case definitions	1	2	3	2	?
Data quality	1	1	2	2	2
Other (specify)				1 - Capacity to respond	
Comments	Please elaborate on any specific concerns/limitations: Lack of labs and of good communications is still the main barrier to the development of surveillance in Iraq. Acceptance of case definitions by clinicians may prove a problem – I have found this to be so elsewhere in the past.			Capacity to respond to any identified outbreak or change in pattern clearly depends on the skills and resources of the responsible teams,which I understand is no problem in Iraq. Nevertheless, access to the different areas and possibility to rapidly confirm an epidemic by laboratory if necessary make the response also dependable from general stability (security, political context, etc) which is an important concern in Iraq.	*There is a need to strengthen laboratory support services so that laboratory confirmation of reported diseases is there. The value of having such a system is permitting early alerting of the laboratory sector of the need to get necessary materials out to the affected area(s) so that appropriate laboratory specimens can be collected and transported to the field. Diseases under surveillance that would benefit from laboratory diagnostics include most of the diseases on the immediate reported list. Specifically: cholera, diphtheria, foodborne botulism, hemorrhagic fever, rabies, anthrax, malaria, measles, meningococcal meningitis, pertussis, plague and yellow fever. However, a qualification should be mentioned here. Reporting of suspected cases should not be delayed waiting for laboratory confirmation. Perhaps there should be a column*

to allow for "suspected" vs "confirmed" and then qualify "confirmed" as either clinically or laboratory. The weekly reported diseases that would also benefit from laboratory confirmation include; brucellosis, chlamydia, gonnorhea, leprosy, hepatitis (A, B, C, E), hydatid disease, leishmaniasis, mumps, rubella, schistosomiasis, shigella, syphilis, TB and typhoid fever.

	EXPERT # 1	EXPERT # 2	EXPERT # 3	EXPERT # 4	EXPERT # 5
Recommended Features/Functionality					
Direct export of data into EPI-info or other programs. Which one(s)?	Y - Epi-info	Y	Y		Y - Theoretically the excel spreadsheets can be converted to EPI INFO files, and to other statistical software, but whichever programs are currently used by the MOH would appear to be the most appropriate ones to have direct exports to.
Additional GIS layers (locations of schools, roads, etc) Which one(s)?	Y	Y		Y - Current Access	Y -Would add the next lower geographical level below that of district if available
Telephone-accessible information menu for case definitions	Y	Y	Y		Y
Telephone-accessible information menu for diagnosis or treatment guidelines	Y	Y	Y		Y
Telephone-accessible information menu for other information (What?)	Y - Travel Histories	Y			
Additional data quality checks (please describe)		Y			
Additional flexibility to modify disease lists	Y, But with care	Y	Y	Y	Y - This should be available at the central level
Additional built-in analytical ability (please describe)	N, But need ability to export to Epi-info for analyses	Y	Y		Y - the ability to analyze date of onset vs date of report is a good function to assess the surveillance system and improve upon reporting.
Ability to create/implement ad hoc questionnaires	N - Can be done in Epi-info	Y	Y		
Other?				Y - Incorporation of injuries, possibility to view pie graphs and addition of total number of deaths to the reports	

	EXPERT # 1	EXPERT # 2	EXPERT # 3	EXPERT # 4	EXPERT # 5
Which of these enhancements would you consider to be the most important?	Data Export	*All of these enhancements would be part of the software that CPA wants to provide to the MOH.*	I think the flexibity to modify the list and the type of information needed according to the epidemiological situation is important to be sure that we are collecting the data that is important and for the diseases which are affecting the public health situation.	Additional GIS layers	
Comments				Additional GIS layers incorporating permanent updates on real access and current security concerns is probably one of the most important additions this application could have in the Iraq context. It clearly impacts capacity to respond, highlights needs for decentralized stocks and revision of strategies for outbreak investigation and control. Although true pie and other graphs can be easily prepared by exporting data to excel, having the tool incorporated can highlight slight differences and call attention on specific diseases that are not so evident in a listing or a bar. An enhancement advisable to incorporate in the current context could be hospitalizations secondary to injuries, particularly war injuries which I assume are a health priority at the moment.	

	EXPERT # 1	EXPERT # 2	EXPERT # 3	EXPERT # 4	EXPERT # 5
Features/functionality Comments	Some diseases appear toi be absent. I could not find cutaneous anthrax which is much more common than inhalation anthrax in Iraq. Also better travel histories and a positive prompt to obtain these would be a help. Whilst the yellow fever case clearly must have traveled, even a travel history for malaria cases would be a help especially if a case of falciparum is discovered (happened last year)		· In the home page were we can access the new immediate reports, although the number of new immediate reports is zero when I clicked the number , a list of cases appeared while I expect the page to be empty. · I have noticed sometimes that the notification date was earlier than the report date, I don't know if it is possible not to accept the notification date if it is ealier than the report date.· Regarding graphs, the data can presented in bars only. It will be good to present the data in other types of graghs as lines and biecharts, etc.· For maps, the date options are this week, last week, this month and last month, it will be good if we can have more flexibility in terms of time. Also I didn't manage to print the map.· It will be good if we can see the list of messages sent out.	Assuming internet access is not an issue, SMART allows competent authorities to access data in a rapid, organized and analytical manner. My opinion is that current features provide the required tools to identify outbreaks and analyze evolution of health priorities. I find the possibility to customize a unique feature in this application, it brings additional comfort to the analyst, which I assume is a decision maker also busy with other tasks.	It is difficult to really assess the practicality of the system in the absence of real data and evaluating it in context with historical data collection in the area. In addition, there is no information available that allows for an assessment of accessibility ease. Have all health facilities on the system been able to access the system at all times? Have the phone lines been down? Has the internet access been compromised? What is the reality of connectivity in Iraq at the moment? It would be useful to do an assessment of the types of voice mail communications to see the impact on communications, use for "continuing education" and use for "problem resolution". Looking at the choices of diseases for immediate reporting, it is not clear what alternative diseases #1 and #2 are, outbreak of a disease, unusual health event are. Is the "notes" column used for descriptives? And if so, has there been use of the notes column on the part of the reporting personnel (and use of the comments column in the weekly reports)?

	EXPERT # 1	EXPERT # 2	EXPERT # 3	EXPERT # 4	EXPERT # 5
Expansion Comments	I would like to hear what the local users felt about it. Also how it will integrate with the national system that is being developed and its software needs to be considered carefully. It is a useful tool that would complement the new system in my opinion.	As you know, CPA is interested in helping the MOH develop a national computer based national reporting system. SMART could/should be incorporated into the planning.	To be sure that communications are excellent at all levels to ensure good coverage and the continuity of collecting data. Well training for the concerned persons at al levels. Specific disease control programs to become involved in the general disease surveillance programme (Integration). It's important to start thinking about the involvement of the private sector in the disease surveillance to be sure that we are not under estimation.	Besides the mentioned concerns on laboratory capacity, expansion of the system in the country should be assessed also incorporating capacity to respond by region.	It would make sense to do an evaluation of the constraints to reporting experienced in the pilot areas. Reporting seems not to have been consistent in all areas (at least based on the front page of the system. Constraints to use of the system should be looked at and addressed in the expansion stage. After such evaluation it seems a logical next step to implement the system nationwide and re-evaluate post expansion.Am not sure the graphing function at present enhances the information. It would be more useful to include a longer time line for graphing, and then permit graphing by week (or month depending upon the disease) for the current year and the previous year. A five week reporting timeframe is not very much for visualizing what is going on. At the moment the operational time of the system is reduced, but with time it will be longer and the longer time frame epi curve graphing will be more meaningful.

Annex 8: Analysis of Data from System Logs

User (De-identified)	Number of Reports	Number of Modifications	Calls per User	Max Duration of Calls	Min Duration of Calls	%calls leading to report
A	13		15	439	0	86.67%
B	13		14	295	51	92.86%
C	10		18	759	0	55.56%
D	14		19	542	72	73.68%
E	14		16	881	0	87.50%
F	14		17	190	49	82.35%
G	14		17	803	0	82.35%
H	12		13	263	55	92.31%
I	51	1	83	818	0	61.45%
J	11		16	626	117	68.75%
K	13		15	441	74	86.67%
L	15		26	324	58	57.69%
M	13		15	1517	99	86.67%
N	13		16	1771	0	81.25%
O	14		18	812	0	77.78%
P	13		14	248	89	92.86%
Q	14	1	22	427	0	63.64%
R	14		23	272	90	60.87%
S	14		18	209	0	77.78%
T	9		14	344	0	64.29%
U	14		16	10647	0	87.50%
V	12		18	2103	77	66.67%
W	14		16	272	0	87.50%
X	14		18	296	0	77.78%
Y	15		18	286	0	83.33%
Z	13		18	227	0	72.22%
AA	0		2	8987	1949	0.00%
BB	14		20	281	0	70.00%
CC	13		14	244	51	92.86%
	407	2	549			74.86%

Annex 9: Suggested customizations changes

قطاعات الرعاية الصحية في المحافظات
PRIMARY HEALTH DISTRICTS

GOVERNORATES	DISTRICTS	القطاع	المحافظة
NINEWAH	Right Mosul	الموصل ايمن	نينوى
	Left Mosul	الموصل ايسر	
	Atraf al Mosul	اطراف موصل	
	Talafar	تلعفر	
	Telkif	تلكيف	
	Hamdanya	الحمدانية	
	Sinjar	سنجار	
	Baaj	البعاج	
	Gayara	القيارة	
	Hatra	الحضر	
	Makmor	مخمور	
KIRKUK	Kirkuk	كركوك	كركوك
	Hawija 1	الحويجة 1	
	Hawija 2	الحويجة 2	
	Dakok	داقوق	
	Debis	دبس	
SALAALDIN	Tekrit	تكريت	صلاح الدين
	Samara	سامراء	
	Bald	بلد	
	Dor	الدور	
	Dejil	الدجيل	
	Beji	بيجي	
	Surgad	الشرقاط	
	Doz	الطوز	
DIALA	Bagoba	بعقوبة	ديالى
	Kalis	الخالص	
	Mugdadia	المقدادية	
	Baldroz	بلدروز	
	Kanagin	خانقين	
Baghdad Rasafa	Rasafa	الرصافة	بغداد الرصافة
	Sadir city	الصدر	
	Adamya	الاعظمية	
	Median	المدائن	
Baghdad Kergh	Kergh	الكرخ	بغداد الكرخ
	Khadimya	الكاظمية	
	Mahmodia	المحمودية	
	Abu garib	ابو غريب	
Anbar	Ramadi 1	الرمادي 1	الانبار

	Ramadi 2	الرمادي 2	
	Falloja	الفلوجة	
	Amaria	العامرية	
	Hiat	هيت	
	Hadytha	حديثة	
	Qaium	القائم	
Babil	Hilla	الحلة	بابل
	Mesiab	المسيب	
	Mahaweel	المحاويل	
	Hashmia	الهاشنية	
Wasit	Kut	الكوت	واسط
	Hai	الحي	
	Numania	النعمانية	
	Azizia	العزيزية	
	Sowira	الصويرة	
Kerbala	Kerbala	كربلاء	كربلاء
	Hindya	الهندية	
	Husinia	الحسينية	
Najaf	Najaf	النجف	النجف
	Kufa	الكوفة	
	Manathra	المناذرة	
Diwanyah	Diwanyah	الديوانية	الديوانية
	Afk	عفك	
	Shamia	الشامية	
	Hamza	الحمزة	
Muthana	Samaoa	السماوة	المثنى
	Rumytha	الرميثة	
	Kidir	الخضر	
Thiqar	Nasryah	الناصرية	ذي قار
	Shatra	الشطرة	
	Rafai	الرفاعي	
	Suk Al Shiuk	سوق الشيوخ	
	Jabaiash	الجبايش	
Misan	Amara 1	العمارة 1	ميسان
	Amara 2	العمارة 2	
	Amara 3	العمارة 3	
	Amara 4	العمارة 4	
Basrah	Basrah 1	البصرة 1	البصرة
	Basrah 2	البصرة 2	
	Zubiar	الزبير	
	Mediana	المدينة	
	Qurna	القرنة	
	Shut al Arab	شط العرب	
	Abu al Qasieb	ابو الخصيب	
	Hartha	الهارثة	

Dahok	Dahok	دهوك	دهوك
	Somial	سميل	
	Zako	زاخو	
	Amadia	العمادية	
	Aqra	عقرة	
	Shikan	الشيخان	
Erbil	Inside	داخلي	اربيل
	Shaglao	شقلاوة	
	Soran	سوران	
	Sahl Erbil	سهل اربيل	
	Barzan	بارزان	
	Joman	جومان	
Sulymanyah	Center	المركز	السليمانية
	Zimnako	زمناكو	
	Glazarda	كلازردة	
	Saidsadiq	سيد صادق	
	Halabja	حلبجة	
	Penjewen	بنجوين	
	Dokan	دوكان	
	Sharbazher	شهربازار	
	Bitwen	بتوين	
	Kalar	كلار	
	Darbandikan	دربنديخان	
	Chamchmal	جمجمال	
	Pishder	بشدر	

Notes about smart card

1- in Arabic the following changes in translation of name of diseases:

داء السحايا تصبح داء السحايا السحائي

داء الكزاز تصبح الكزاز الولادي

داء الملاريا تصبح الملاريا الخبيثة

2- there is possibility to include other diseases

3- there should be collective report for weekly bases

4- in Arabic the following changes in translation in the Submit report:

بدلا من المدينة تكون القطاع في السؤال اسم المدينة التي يقيم فيها المريض

6- hospitalization and mortality is to be in 2 codes one for hospitalization should be yes or no and a different code with cured or dead

7- sometimes the patient is in critical condition and the notification is sent and later the patient die. To have a solution for this possibility.

8- in Arabic the following changes in translation in the Submit report:

في حقل الاستشفاء يصبح هل ادخل المريض الى المستشفى نعم او كلا

في حقل الوفيات يصبح هل المرض شفي من المرض ام توفي

The immediately notifiable diseases

الأمراض الواجب الإخبار فورا عنها

Cholera	الكوليرا
Acute flaccid paralysis (AFP) and poliomyelitis	الشلل الرخو الحاد وشلل الأطفال
AIDS	متلازمة العوز المناعي المكتسب (الإيدز)
Hemorrhagic fever	الحمى النزفية
Falciparum malaria	الملاريا الخبيثة
Diphtheria	الخناق
Measles	الحصبة
Food-borne botulism	التسمم الوشيقي
Neonatal tetanus	الكزاز الولادي
Meningicoccal meningitis	السحايا السحائي
Plague	الطاعون
Yellow fever	الحمى الصفراء
Relapsing fever	الحمى الراجعة
Pulmonary anthrax	الجمرة الخبيثة الرئوية
Typhus	التيفوس
Outbreak	التفشيات
Unusual health event	الحوادث الصحية غير الاعتيادية

Collective reportable diseases (weekly reports)

Rabies	داء الكلب
Pertussis	السعال الديكي
Viral hepatitis	التهاب الكبد الفيروسي
Cutaneous leishmaniasis	اللشمانيا الجلدية
Visceral leishmaniasis	اللشمانيا الحشوية
Bacillary dysentery	الزحار الباسيلي
Brucellosis	حمى مالطا
Chickenpox	جدري الماء
Rubella	الحصبة الألمانية
Schistosomiasis	البلهارزيا
Toxoplasmosis	داء المقوسات
Hydatid cyst	الأكياس المائية
Viral meningitis	التهاب السحايا الفيروسي
Bacterial meningitis	التهاب السحايا الجرثومي
Mumps	النكاف
Pulmonary tuberculosis	التدرن الرئوي
Extra- pulmonary tuberculosis	التدرن خارج الرئة
Sexually transmitted infections	الامراض المنقولة جنسيا
Scabies	الجرب
Benign malaria	الملاريا الحميدة
Pneumonia	ذات الرئة
Animal bite	عضة الحيوانات
Typhoid fever	التيفوئيد
Cutaneous anthrax	الجمرة الخبيثة الجلدية